DOCUMENT RESUME

ED 450 699 IR 020 580

TITLE	EDUCAUSE '99: Celebrating New Beginnings. [Proceedings] (Long Beach, California, October 26-29, 1999).
INSTITUTION	EDUCAUSE, Washington, DC.
PUB DATE	1999-00-00
NOTE	571p.; For selected individual conference papers, see IR 020 581-603.
AVAILABLE FROM	For full text: http://www.educause.edu/conference/e99/proceedings.html.
PUB TYPE	Collected Works - Proceedings (021)
EDRS PRICE	MF02/PC23 Plus Postage.
DESCRIPTORS	Access to Education; Computer Software Development; Computer System Design; *Computer Uses in Education; *Educational Development; *Educational Technology; Elementary Secondary Education; Group Activities; Higher Education; Information Technology; Internet; Online Systems; Partnerships in Education; Technological Advancement

ABSTRACT

This proceedings of the 1999 EDUCAUSE Conference contains papers presented in six tracks: Building the New Information Technology Foundation and Infrastructure; Technology-Enhanced Teaching and Learning; Renewing Administrative Services; Outreach, Public Service, and New Communities; Advancing the Leading Edge; and the EDUCAUSE Track. Topics of papers include: introducing students to computing issues; data warehouse solution using university consortia and business outsourcing; dynamic and individualized Web system; warehouse design; technology-enhanced admissions process; imaging technologies; impact on students of online materials in university courses; cooperative development of faculty development resources; model for hardware and software acquisition; Web-based services in Committee on Institutional Cooperation (Big Ten) libraries; developing a new administrative system; collaborative support for the distributed university; what Web instructional techniques suggest about what faculty want; potential and risks of digital libraries; teaching and learning with online images; broadbanding initiative; state-wide approach to public service excellence; using technology to enable alumni and outside experts to enrich a class; unintended impact of technology; authorization on the Web; implementation and implications of digital services in learning centers; new systems implementation projects; information technology integration in a small rural school; integration of digital satellite and terrestrial networks for education and training; intellectual property and copyright; information technology literacy for general education and online community; meta data integration; building a statewide student advising system; U.S. distance education and developing countries; PBS develops institution-neutral online services for non-traditional adult learners; pooling resources of dozens of schools; using Java to develop programs designed to support administrative users in a university environment; planning, strategy and technology to reach rural, remote, and underserved Americans; tools for faculty-directed inquiry and improvement; computational science curricula, high performance computing and the professional organizations; sustaining a virtual support organization; library resource sharing program; supporting faculty uses of the Web; Internet and the digital divide; model for interactive distance learning; a "Roles" database; toolkit for class home page

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development/management; transformation of education by information and communication technology; building a statewide partnership for higher education; CD-ROM for faculty development and statewide training; project for unified access for the 21st century; university and state K-12 education partnership providing online resources and training; empowered process for information technology planning and implementation; e-mail as official means of communication; virtual organizations, virtual mentoring, and at-risk youth; university simulation game; and visual resource system to improve teaching and learning. (AEF)

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EDUCAUSE '99
Celebrating New Beginnings

[Proceedings]

Long Beach, California
October 26-29, 1999

EDUCAUSE

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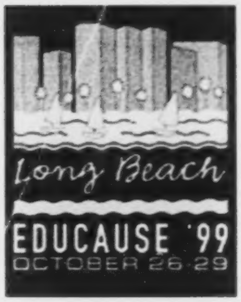

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EDUCAUSE '99
Celebrating New Beginnings

Proceedings of EDUCAUSE '99 are now available online. Includes papers, audio/video, and supplemental materials from EDUCAUSE '99.

Long Beach (CA) Convention Center – October 26-29, 1999

EDUCAUSE '99 is a stepping stone to the future of information technology in higher education. Th conference provides the platform for meeting the challenges the new century brings by offering an incredible and diverse program of top-rated speakers, presenters, and exhibitors. It also gives attendees the opportunity to network with their peers and to learn and share with the people who use and apply technology on a regular basis.

The links below and to the left will take you through everything the conference has to offer, help yo get to Long Beach and find a place to stay, acquaint you with the city, and help you get the most o of your EDUCAUSE '99 experience.

We hope you can join us in Long Beach. Whether it's EDUCAUSE '99, or one of the many conferences EDUCAUSE offers throughout the year, we encourage you to take advantage of thes professional development opportunities and get the edge you need to make the most-informed technology decisions possible.

Get the Most from EDUCAUSE '99
Check this page first for hints on how to get the most from your conference experience.

The Program
We have a terrific lineup of speakers, preconference seminars, track sessions, poster sessions, constituent groups, current issues sessions, and birds of a feather sessions.

Corporate Participation
Our corporate participants play an important role in the conference. They provide workshops and presentations, display their goods and services, and provide sponsorships for products, food and refreshments, the Tuesday evening hospitalities, and the Thursday evening extravaganza aboard the Queen Mary.

Registration
The quickest and most efficient way to register is online. Our registration page will take you there. That's also where you can find who has already registered. Try our Dynamic Registration List to select registrants by geographic location, institution Carnegie class, FTE, or job title.

EDUCAUSE '99 Shuttle Service
You'll have no trouble getting from your hotel to the convention center and back. We've built an extensive shuttle system to see that no one waits more than 10 minute for a ride. There are also shuttles from the airports to hotels. For complete information see our shuttle page.

Where to Stay
We have 21 hotels for the conference. Information about them, as well as information on air and car rental discounts, is available on our hotel and travel page.

Long Beach Information
Long Beach is a great town! To learn more about it, check out the sites for the Long Beach Convention & Visitors Bureau and the Long Beach Convention Center.

Speaker & Presenter Information
If you're giving a speech or making a presentation at EDUCAUSE '99, we have some forms for you to fill out. You'll find the information on our speaker pages.

Can't Find It?
If there is something you think should be on the EDUCAUSE '99 Web site and you can't find it, try using our frame-based site index. If that doesn't help, contact our Customer Service department at 303-449-4430 or conf@educause.edu.

(Follow this link for general information about the conference and EDUCAUSE.)

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Preregistration (online, phone, fax, e-mail, etc.) for the EDUCAUSE '99 conference is closed. If you are planning to attend you can register on site at the Long Beach Convention Center beginning on Sunday, October 24th, at 8:00 a.m.

Registration Information

Available on this page:
Conference Fee information
Payment and cancellation policies
Dynamic registration list (You select what you want to see!)
Registration lists (sponsored by www.mybytes.com) sorted by name, organization, or region

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Conference Fees

On-site member	$470
On-site nonmember	$695

Payment & Cancellation Policies

PAYMENT POLICY: On-site registrations must be accompanied by payment either by check, money order, cash, or credit card.

CANCELLATION POLICY: Cancellations received after September 27, 1999 will not receive a refund.

Registration Lists

The EDUCAUSE '99 registration lists are sponsored by www.mybytes.com .

- Complete registration list in PDF format. (You must be registered for the conference to receive this.)
- Dynamic registration list
  This link allows you to create a dynamic registration list of attendees. You can use the resulting registration list to network with peers prior to and during the conference.
- Registrants listed by name
- Registrants listed by organization
- Registrants listed by geographic region

If you are paying a registration invoice, please send payment to:

EDUCAUSE Lock Box
Department 781
Denver, CO 80291-0781

(Note: Use U.S. Postal Service only. FedEx, UPS, and other delivery services will not deliver to a post office box.)

Please send any other correspondence to:

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Hotel & Travel Information

EDUCAUSE '99 is at the Long Beach Convention Center in California. Information about the center, as well as other information about Long Beach, is available through the Long Beach Convention & Visitors Bureau site.

Activities begin on Tuesday, October 26, with the preconference seminars. The conference opens Wednesday morning with the general session featuring Gen. Colin L. Powell. The conference will close with Friday's general session, which will end at approximately 11:30 a.m.

Hotel

Shuttle service will be provided for 17 of the 21 conference hotels (the other four are within easy walking distance of the convention center).

Although most of our conference hotels are sold out, our housing bureau, Accommodations Express is getting cancellations and changes daily so we encourage you to contact them directly for availability at the listed hotels.

Accommodations Express accepts calls 24 hours a day, seven days a week. Here's how to reach them by phone:

- U.S. & Canada: 800-558-3571
- International: 609-391-2100

Before making your reservations, you may want to check our hotel list to see how the hotels compare to one another with respect to distance from the convention center, distance from the airports, and services they offer.

Air Travel

Conventions in America (CIA) is the official EDUCAUSE '99 travel agency.

- 1-800-929-4242 (outside U.S. and Canada call 619-232-4298)
- Fax: 619-232-6497
- Reservation hours: Monday - Friday 6:30 am - 5:00 pm Pacific Time
- Web site: http://www.scitravel.com/ (use #393)
- E-mail: flycia@scitravel.com
- *All customers of CIA receive free flight insurance of $100,000*

Fly into LAX (Los Angeles), Long Beach, or Orange County between October 21 - November 3, 1999 and receive discounted airfares. Call CIA at 1-800-929-4242 (outside the U.S. and Canada call 619-232-4298) and ask for **Group #393** *to receive the lowest available fares on any carrier and* *discounts on American and United as listed below.*

American Airlines -- save 5 percent on the lowest applicable fares or take advantage of the special Zone Fares which can save you money without a Saturday night stay. Take an additional 5 percent off these fares with minimum 60-day advance purchase. If you call the American directly 1-800-433-1790 or use your own agency, please refer to Starfile # 7409UJ

United Airlines -- save 5 percent to 10 percent on lowest applicable fares or take advantage of the special Zone Fares which can save you money without a Saturday night stay. Take an additional 5 percent off these fares with minimum 60-day advance purchase. If you call United directly 1-800-521-4041 or use your own agency, please refer to ID # 555 JK

Airport Shuttle Service

XPRESS SHUTTLE operates shuttle service to and from the following airports. Advance reservations are required and can be made by calling 800-474-8885 or 310-216-3336. To assure a smooth transfer, provide XPRESS SHUTTLE with your flight arrival/departure information. At the airport, look for yellow vans with blue tops.

Note: You will need to print out this shuttle discount coupon and bring it with you to Long Beach to get the fares listed below.

- Los Angeles International Airport (LAX)
  $13.00 prepaid - Dial '56720' on a courtesy phone in the Baggage Claims area. Go to 'Van Stop' and look for a shuttle coordinator wearing a yellow jacket.
- Long Beach Airport
  $10.00 prepaid - Look for XPRESS SHUTTLE signage
- Orange County Airport
  $18.00 prepaid - Dial 1-800-474-8885 on a pay phone. Exit the Baggage Claims area and go to the Transportation Center. Look for XPRESS SHUTTLE.

Car Rental

For discounted car rentals, use Avis Rent A Car, Inc. in Long Beach and Alamo Rent A Car in LAX complex airports. *Both will offer special low EDUCAUSE '99 rates with unlimited free mileage*. Please refer to the EDUCAUSE '99 codes if you call directly or use your own agency. Avis 1-800-331-1600 (AWD # J949091) or Alamo 1-800-732-3232 (ID # 417740GR)

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Transforming Education Through Information Technologies

Abstract

Category: Papers Presented at EDUCAUSE annual conferences

ID Number: EDU9900

Title: Celebrating New Beginnings, Proceedings of the 1999 EDUCAUSE Conference

Author:

Organization: EDUCAUSE

Year: 1999

Abstract: These are the proceedings of the 1999 EDUCAUSE Conference held in Long Beach, California, October 26-29, 1999. Papers were presented in six tracks: Building the New Information Technology Foundation and Infrastructure, Technology-Enhanced Teaching and Learning, Renewing Administrative Services, Outreach, Public Service, and New Communities, Advancing the Leading Edge, and The EDUCAUSE Track.

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Proceedings and Post-Conference Materials

Video tapes of the Featured Speakers and most General Session speakers as well as cassette tapes of of the other sessions are available through the Recorded Resources Corporation. Call (410) 969-TAPE for more information.

Track Sessions

- Available papers via the EDUCAUSE Information Resources Library
- Track descriptions with links to presentations and abstracts (Note that presentations with an available paper will have an asterisk by the title)

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- Rita Colwell (56k Video)
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  President and CEO of the J. Paul Getty Trust

Featured Speakers

- Universal Access: Craze or Obligation? (56k Video)
  Ellen Earle Chaffee, President, Mayville State University and Valley City State University
- Virtual Continuity (56k Video)
  Nancy M. Cline, Roy E. Larsen Librarian of Harvard College, Harvard University
- Scholarship and the Management of Information in the Age of the Electron (56k Video)
  Stanley Chodorow, Chairman of the Board of Directors, Council on Library and Information Resources, University of California, San Diego
- Phone Calls: the Fusion of Virtual Reality, Networking, Supercomputing, and Data Mining (56k Video)

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Thomas A. DeFanti, Director, Electronic Visualization Laboratory, University of Illinois at Chicago

- Rethinking the Land Grant University for the Digital Age (56k Video)
  Karl S. Pister, Vice President for Educational Outreach, University of California Office of the President
- From Legacy to Leverage: Creating Synergy In A Multi-Campus System (56k Video)
  Charles Reed, California State University, Office of the Chancellor
- Bureaucracy Unplugged (56k Video)
  Karen A. Stephenson, Assistant Professor, Anderson Graduate School of Management, University of California, Los Angeles

Track Sessions

- Wireless University: Why PCs Without Wires Are the Future of Campus Academic, Administrative, and Student Computing (56k Audio)
  Phil Belanger, Vice President, Aironet Wireless Communications Inc.
- Centers for Teaching, Learning, and Technology: What Fits Your Institution? (56k Audio)
  Kathleen Christoph, Director, DoIT Learning Technology and Distance Education, University of Wisconsin-Madison, Carrie E. Regenstein, Asst Dean Ed Tech & Director, Acad Tech Svcs, University of Rochester, Ruth M. Sabean, Assistant Director, Educational Tech, University of California, Los Angeles
- Putting Java to Work at UCSD: A Success Story (56k Audio)
  Ron Block, Project Leader, Payroll and Personnel Systems, University of California, San Diego, Henry Jaime, Project Leader, Strategic Projects Java Development Coordinator, University of California, San Diego, Jude Poole, Director, Biology Computing Services, University of California, San Diego
- Coming Unwired: Making A Wireless Network Happen! (56k Audio)
  James Doherty, User Support Manager, Johns Hopkins University Jon Garvin, Network Manager, Johns Hopkins University Ross A. McKenzie, Director, Information Systems, Johns Hopkins University
- Implementing an E-Business Focused Service Strategy (56k Audio)
  Michael Handberg, Director, Web Development, University of Minnesota-Twin Cities Robert B. Kvavik, Associate VP for Academic Affairs, University of Minnesota-Twin Cities
- Virtual Universities: A State-by-State Analysis of Best Practices (56k Audio)
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  Carl W. Jacobson, Director, MIS, University of Delaware

- Tips and Tricks for Online Courses (56k Audio)
  Jonathan Kadis, Director, Multimedia and Distance Learning Services, Utah State University, Sue M. Legg, Director, Office of Instructional Resources, University of Florida, Terry Morrow, Associate Director, Office of Instructional Resources, University of Florida, Kevin Reeve, Manager, Instructional & Internet Development, Utah State University

- Assessing the Impact on Students of On-line Materials in University Courses (56k Audio)
  Nicholas C. Laudato, Associate Director, Instructional Technology, University of Pittsburgh, Joanne M. Nicoll, Associate Director, Instructional Development and Distance Education, University of Pittsburgh

- Enterprise Software Projects: The Veterans' View (56k Video)
  Marilyn A. McMillan, New York University, Jack McCredie, University of California, Berkeley, Joseph P. Mullinix, Yale University, James D. Bruce, MIT

- Distance Education: Are We Being Realistic? (56k Audio)
  Diana G. Oblinger, University of North Carolina

- 1999 Annual Gartner Group Update (56k Audio)
  Michael R. Zastrocky, Research Director/Academic Strategies, Gartner Group, Inc.

- Hiring and Retaining IT Talent: A Critical Challenge for Higher Ed (56k Audio)
  Michael R. Zastrocky, Research Director/Academic Strategies, Gartner Group, Inc.

Corporate Presentations

- Transforming Teaching and Learning with QuickTime 4 (QuickTime 4 format)
  Frank Casanova, Director QuickTime Product Marketing, Apple Computer
  via Apple Computer's website

EDUCAUSE '99 Awards Video

- EDUCAUSE '99 Awards Video (T-1 Video)
- EDUCAUSE '99 Awards Video (56k Video)

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Other Materials

Current Issues Roundtable Discussions

- Recruiting, Rewarding, and Retaining Good IT

Technical Staff
Onedia H. Sylvest, Associate Director, Computing and Information Services, Texas A&M University

- Achieving Student-Centered Customer Service: One-Stop Processing
  Robert B. Kvavik, Associate VP for Academic Affairs, University of Minnesota-Twin Cities
- Preparing Your Campus for E-Commerce: Issues and Challenges
  Barbara H. Morgan, Director, Strategic Technology Planning, University of California, Berkeley
- Staff Development and Reskilling: Keeping Up with Technology and Organizational Change
  Allison F. Dolan, Director, IT Staff Development & Resource Management, MIT
- Measuring the Costs and Benefits of Campus IT: Will We Ever Get There?
  Christopher S. Peebles, Associate VP and Dean for Information Technology, Indiana University
- Organizing and Staffing for the Convergence of Voice, Data, and Video on the Network
  Tad B. Pinkerton, Acting CIO, University of Wisconsin-Madison
- Wireless Networking: Is It Right for Your Campus?
  Judy L. Lilly, Asst VP, Advanced Network Infrastructure & Systems, Virginia Tech
- Improving Project Management and Delivery
  Deborah A. Lauriano, Assistant Director, Information Resources, University of California, Davis
- The Challenge of 24X7 Technology Support
  John E. Bucher, Director of Information Technology, Oberlin College

Presentation Slides from Preconference Seminars

- Seminar 4A - Refreshing the Web Enterprise: A Comprehensive Approach (PPT slides)
  Carl W. Jacobson, University of Delaware
- Preconference Seminar 8A - The Impact of Recent Federal Policy Developments on Campus Information Technologies (PPT Slides)
  Susan Fratkin, Fratkin Associates, Aleck Johnson, Leslie Harris & Associates, Casey Lide, EDUCAUSE Garret Sern, EDUCAUSE, James E. Williams, EDUCAUSE

Presentation Slides from Corporate Presentations

- PricewaterhouseCoopers LLP - Ready or Not: E-Business Technology Forecast (PDF)
  Terry Retter, PricewaterhouseCoopers LLP

Presentation Slides from Track Presentations

- Project and Technical Management Challenges of Enterprise Resource Planning (ERP) Application Development and Implementation (PPT slides)
  Indy Crowley, Yale University

- A View From the Hill to the States (PPT slides)
  Susan Fratkin, Fratkin Associates, Aleck Johnson, Leslie Harris & Associates, Mark A. Luker, EDUCAUSE, Garret Sern, EDUCAUSE

- Leading Reorganizations (PPT slides)
  Tara Lynn Fulton, Bucknell University

- An Architectural Prototype for Certificate-based Authentication and Authorization
  Sal Gurnani, University of California Office of the President

- Services-Rich Network Environment: The Next Generation Applications Infrastructure (PPT slides)
  Theodore A. Hanss, Internet2/UCAID

- E-Business: Change, Opportunity, Challenge (PPT slides)
  Carl W. Jacobson, University of Delaware

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  Ruth M. Sabean, University of California, Los Angeles

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Digital Ekistics, Washington State University, The Casey Family Program, Kevin C. Facemyer, Nils S. Peterson, John Emerson, Claire Van Wingerden, Tomikia Perkins

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VISC: Creating a Visual Resource System to Improve Teaching and Learning [1999]
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Abstract

Category: Papers Presented at EDUCAUSE annual conferences

ID Number:	EDU9916
Title:	'Smart Computing' -- Orienting Your Students
Author:	Paul J. Millis
Organization:	University of Michigan
Year:	1999
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'Smart Computing' -- Orienting Your Students

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Abstract: This paper discusses how to present new students with their initial exposure to policy, security, and ethical computing issues. It includes a discussion of balancing entertainment and content to best reach incoming students as part of a busy orientation program. The paper also addresses how to highlight issues, pick a theme, and select vignettes for the presentation.

'Smart Computing' -- Orienting Your Students

Introduction

The Office of Policy Development and Education participates in summer orientation to properly introduce students to proper use of information technology resources at the University of Michigan. This presentation is know as 'Smart Computing. This year we took a fresh look at how to approach 'Smart Computing'. We created video vignettes to highlight key issues for incoming students. This paper examines the creation of the 'Smart Computing' presentation. It examines the objectives of the presentation and how it was developed and targeted to the audience. It also looks at results.

Objectives

Inform and entertain: It can be a real challenge to get students to see how anything theoretical applies to them, especially in the midst of the tumult that accompanies orientation. We set out to create a presentation on ethical computing issues that was both entertaining and thought provoking.

This year, 'Smart Computing' was developed to address the issues students may be confronted with immediately upon entering the UM information technology environment. The presentation for freshman orientation was designed to teach students things to do to protect their resources, and things not to do (share their password, indiscriminately copy material from the internet, etc). We also attempted to raise awareness of things that may be done to them by hackers, identity thieves or inadvertently by other users.

The review of the orientation evaluations from the prior year revealed some important information related to the 'Smart Computing' segment. Probably the most important thing revealed was that the content was important and that the academic units wanted the material covered. However, it was clear that the way the material was developed and presented needed to be rethought. We needed more student involvement in development. Presenters needed to be more engaging and energetic.

Content-wise we needed to ensure that the presentation was not to frightening or offensive to the staff and students, without sacrificing the chance to talk about important issues.

To meet these concerns, we endeavored to start designing the presentation to make sure that our development included a feedback loop so the presentation was being looked at on an on-going basis.

It became clear that we would have to go beyond the 'talking heads' of prior years presentations if we were to leave any kind of lasting impression on the audience. It was also clear that our choice of topics and media for presentation were keys if we wanted to reach the target audience.

Provide food for thought: We often use the slogan "Think About It" to unify our campaigns in the Office of Policy Development and Education. That begs the questions 'what' do we want people to think about and 'why'. The 'what' is addressed by decisions made in choosing content:

> Often enamored and fascinated by the power of electronic media and associated tools, faculty developers, students, and other users fail to examine the underlying implications of their actions.

For the 'why' we must look at the role of the university in providing informational technology resources:

> … we need to be able to foster learning, understanding and higher levels of social cognitive behavior in an environment like a university. This has to be our first commitment. This is not a corporation, not a police state, but a university; a place where we are trying to learn, a place where we are trying to help people understand the implications of their behaviors on themselves and on each other, and where we, as a community, are trying to have an opportunity to speak out about behaviors that are contrary to the values and standards of this community of open discourse.

Publicize the user advocate: Part of our overall strategy in OPDE is to raise consciousness among the students to the functions of the IT User Advocate. The User Advocate is the place where students go for any help solving problems with their use of resources other than being out of money or forgetting their password. We felt that orientation gave us a chance to reassure students that they were not alone since they had an advocate to take their side to protect their rights at U-M. We want students to contact the user advocate when they suspect someone is using their account, when they feel harassed through technology, when they are receiving excessive unsolicited advertising or when they are feeling uncomfortable about activity in their accounts.

Audience Psychology

Orientation - Information Overload: The technology portion of orientation takes place on the second morning of orientation for each group of freshmen. The students are housed apart from their parents and can be depended on to have been up too late the prior night, taking part in parties and other social activities. Hence, we battle fatigue; especially with the first groups of the morning. This timeslot forces us to be cognizant of grabbing and holding the student's attention

Further, on the second morning, students are sent through an introduction to information technology at U-M and three separate technological presentations. Along with 'Smart Computing', the students hear a presentation from Residential Computing and participate in an on-line tutorial which allows them to sign on to their accounts, and be introduced to password security, e-mail and library resources. Hence, the groups we got later in the morning had been barraged with information. We were again made cognizant of the student's ability to comprehend and retain information. Clearly, simpler was better.

It also helped build a connection with the audience when we acknowledged their predicament. Empathizing with the students being out late or being deluged with information helped to focus attention on the presentation through understanding.

Setting expectations: As part of designing the orientation program for this year, we asked ourselves, 'what are we trying to accomplish?'. We decided that we wanted students exposed to key issues related to use of computing resources and understand why these issues relate to them. This prospective can be summarized as follows:

> Those who have never been taught to set boundaries, who don't know how, who are unable to because of the newness of the communication medium, need to have examples and be taught and supported in setting their boundaries verbally and technically.

Level of sophistication: The technical sophistication of our user community is changing all the time. As part of the overall technical education effort, a survey is done of computer use among students. The 1998 version of this survey indicated that the availability of technical resources was crucial to 23.9% of our students choosing U-M in 1998, up from 11.7% in the prior year's survey. Almost 80% of the students indicated that information technology resources were a major factor in the decision on where to go to school.

In terms of specific technical resources, survey indicated that nearly 50% of our students read e-mail daily, up from less than 20% two years ago. It also indicated that 88% of our students use the Internet to do research at least on a monthly basis.

Developing the Presentation

In an effort to be more responsive to student concerns, development of the 'Smart Computing' effort was undertaken by a group which included staff from the library, the Office of New Student Programs, ITD and the Office of Policy Development and Education. This team approach was consistent with the approach taken by the entire technology orientation workgroup. The 'Smart Computing' team included a liaison for student concerns working directly with the student orientation leaders in ONSP.

Selection of Media and Approach: In order create a more accessible message for students, we decided to create vignettes on video which could be entertaining as well as springboards for discussion of important issues in the areas of ethics, UM policy and security. We wanted to concentrate on materials that would have an immediate impact on new students. We wished to discuss issues involving technologies all students would need immediately upon joining the U-M community.

Discussion began on a theme that would link the three videos. This discussion commenced with discussion of some link to the Y2K bug. We ended up far from the initial idea because we wanted to make the videos reusable for other educational venues in subsequent years. We ended up with a series of dream sequences; past, present and future. As the 'present-day' sequence developed, we dropped the dream-theme for a more direct approach; using a talk-show motif. The fade showing the passage of time in that video did, however, provide a thematic link to the dream sequences in the other two videos.

Students learn best in the context of a real problem that they need to solve. Hence, we discussed how to make the sessions more interactive, by presenting a scenario, then providing questions and potential answers and allowing students to vote on the potential right answers. This was the presentation model we agreed upon.

Choosing Topics: A number of key issues were explored before deciding what to address in the 'Smart Computing' presentation. We decided to concentrate this year's presentation on three themes.

Password security, use of e-mail (and e-mail groups) and the rules of copyright in cyberspace represented the best tradeoff between messages that the students needed to have early in their careers at U-M and messages that reinforced other ongoing educational campaigns coordinated by OPDE.

Password Security: To address password security, we chose a take-off on the type of 'trash TV' talk shows that have become so pervasive in our popular culture. We attempted to create an amalgam of various talk shows and called it 'Geri Swinger'. Against this backdrop we had the host announce that the topic for 'today's show' is 'people whose lives were changed by technology'. The crux of the vignette is that a student shared his password with his significant other. She used it to gain access to the system. This simple lapse in security led to some pretty serious consequences when she met someone in a chat room. This person harassed the first student, stole his password and generally 'ruined his life'.

Although this vignette is overblown, it is structured to bring out some key issues we deal with on a regular basis. This vignette is used for discussion on sharing passwords, forgetting to log off at campus computing sites, and providing personal information online. The discussion leader emphasized the things that a person can do if they have someone's password.

In addition to these primary issues, the vignette was used, as time permitted, to discuss using the same password for multiple applications, defining a 'secure' password, assessing threats online and safeguarding of personal information.

EMAIL -- Use of EMAIL Groups: To address use of e-mail (especially e-mail groups), we asked ourselves the question, 'what if e-mail was around when the first amendment was being crafted?'. Surely, the founding fathers would have had an e-mail group. The basic premise of the vignette is that a U-M student needs money to buy his girlfriend a birthday present. His roommate suggests that he sell his car to generate funds. While thinking about how to get the car sold, the student falls asleep and dreams that he is James Madison, trying to sell his horse. This dream was suggested by his review of a web-site devoted to colonial newspapers. Upon awakening, the student decides, unwisely, to use his history class e-mail group to sell his car.

The questions that accompany this vignette encourage thinking about the best course of action for the student who wishes to sell his car. We essentially ask the students to decide whether this is a legitimate use of U-M resources. We also introduce the topics of SPAM and off-topic postings to e-mail groups.

In addition to these primary issues, this vignette was used to discuss responsible use of U-M resources. Specifically, we discussed replying to all, chain letters, making a profit using UM resources and respecting other people's boundaries.

We also touched upon the limitations of e-mail as a communication media, NETIQUETTE and FLAMING for discussion with the group.

Copyright and the Internet: To address password security, we chose to use the image of an overworked student who finds himself all too willing to take shortcuts. Our student is writing a paper on the Y2K Bug, but he is short on time and long on deadlines. Not knowing what else to do, he decides to take a nap. His dream sequence is the bulk of this short video. In his dream, our student is writing a paper on the Y3K bug and physically surfs the internet, on an ironing board, grabbing information with his hands and putting it into his paper. The student then awakens with the mistaken assumption that all he has to do is cut things from the Internet and paste them into his paper, thus he will be 'done in no time'

The primary issues we discuss are how to use the web as a resource in writing a paper, how to cite material from the Web correctly and what is copyrighted on the web.

In addition to these primary issues, the vignette was used to discuss public domain material, availability through the undergraduate library of reference material on citation rules, how to obtain permission for use of copyrighted material and the need to respect intellectual property. We also pointed up the copyright problems with music downloaded from MP3 sites.

Other Messages: We closed the session by highlighting the resources available to understand policy on UM's campus. We also re-iterated that the User Advocate is available to protect their rights if they feel harassed, suspect that someone is using their accounts, are getting chain letter (or excessive SPAM) or need advice

Selecting Handouts and Documentation: In order to complement the verbal messages being given the students, we wished to provide them with reference materials related to the issues being addressed. We looked to three basis sources for such material:

Existing Brochures: OPDE has an extensive collection of guidance material on issues of policy security, and ethics. From those, we chose the following:

Proper Use Policy: Students sign this policy as a condition of getting access to U-M's information technology resources. We felt that students should have a written copy of the policy, since they may not have had an opportunity to read it in any depth before getting their password and ID.

Proper Use Guidelines: We provided students with these guidelines to amplify what is in the proper use policy. This handout gives the student some more concrete advice as to what they can and can't do with their accounts

IT User Advocates Bookmark: One of our explicit goals for orientation was to raise consciousness in the community of User Advocate services. We also felt that knowing that there were people on campus who would safeguard their rights would help students decrease their level of fear when it came to exposure caused them by other's misuse of technology resources.

Password Security: The orientations tutorial gives people a chance to experience changing their passwords. Since the students were being taught how to change their passwords, we felt we should discuss how often to change passwords and show them how to set a password that is difficult to crack. That is the purpose of this handout.

Creative Adaptation: We have created a number of handouts as part of training we have done in the past. Often, all that is needed is to update this material. Such was the case with our e-mail *netiquette* handout.

EMAIL Etiquette at UM: We have found our *netiquette* material to be well received in other classes. For orientation, we used it to address the psychology of e-mail, schemes for adding emotional context to e-mail, and how to sound elegant in e-mail by knowing the correct acronyms.

The handout itself needed to be updated due to the relative sophistication of our users. When the handout was originally developed, the *emoticons* (i.e. smiley faces) were a relatively new phenomenon. We updated the emoticon presentation to include more subtle and sophisticated faces used today.

We also updated the e-mail acronyms (e.g. F2F = Face to Face) to include more sophisticated phrases, along with the simplistic ones that have been around for 30 years.

Finally, we provided an updated list of defined computing terms.

A Visual: We wanted our orientation presentation to have a visual identity. We felt this would make the presentation memorable in the minds of the student and also help tie together the three presentations and give them identity as a group.

Think about it: For our visual, we chose to include one of a series of stylized faces we have used in the past for policy and ethics campaigns. Each student packet included one of the four of these stylized faces. We felt that this visual said to the student, 'stop – think about this – it effects everybody'. We also used the handout as a touchstone to reassure students that we knew they wouldn't retain much of the material presented to them during the day. However, we felt that a proper grounding in ethics could provide them a basis for judging how to approach situations, even those they had not previously encountered, because they would not have to remember a specific rule to be able to make the proper response.

Suggestions: In an effort to help students how to deal with real problems they are likely to encounter, the areas represented by the development team were queried to see what actual problems needed to be specifically addressed. Additionally, through the summer, the program was reviewed and modified to include information on newly identified areas of concern and better ways of reaching the students. It was noted that the students were being asked to sign a document agreeing to the stipulations of the "Proper Use Policy" at U-M. It became clear that the students had not always had the time or inclination to read the policy before signing. So, we adapted the 'Smart Computing' presentation to include a brief synopsis of what the students were agreeing to. Granted, this is a gross simplification of the 'fair use' policy. However, this simplified presentation gave students had a feel for what they were agreeing to.

We also tried various ways to make the presentation more immediately relevant to students. Pointing out that they were signing an agreement promising to use resources properly seemed to get their attention. So did using live examples of those things that can happen to the community as a result of compromising security at the individuals level. We spoke specifically of a racial hate-mail incident at another university and a recent computer-hacking incident at U-M to bring home the point relating to the importance of passwords and computer security.

The Presentation Evolves

Changes over time: Our first inclination was to present the vignettes in a 'case-study' format. We planned the seating for the sessions with five students sitting around each of eight tables. We planned to show the video, present questions and possible options and then give the students a couple minutes to discuss the issue and come to a consensus at each table. Upon reaching consensus, each table was instructed to hold up a specially designed puzzle piece (in accordance with the overall orientation theme).

We quickly found two problems with this scenario. First, it took too long for a twenty-minute presentation. Secondly, the students sitting around each table generally didn't know each other. Given the stress of this social situation, there was very little discussion. So, we adapted the presentation so that each student voted individually.

Stories from the Front

They don't believe it yet: The library people who had done the orientation program before had alerted us, that the attitude of the students would evolve over the summer. This was particularly striking and showed how fast students develop at their particular level of maturity. The first students of the summer were three weeks from being high school seniors and exhibited the requisite bravado. As the summer wore on, the students took the orientation programs more and more seriously. It became clear to the students they were about to face an entirely new environment and they better prepare themselves. To be fair, two other factors effected this metamorphosis. These factors were characteristics of the groups that changed over the summer. Early in the summer, large regional high schools send groups of students who know each other together on the same days. This familiarity effects the dynamics of the groups. Secondly, the students who came later in the summer tended to have been less sure of the having the resources to attend U-M. Their attendance indicates that they have been able to get everything worked out, but they seemed to be more serious.

Why might these trends be important? If they were reasonably reliable, they would also effect how the 'Smart Computing' presentation should evolve over the orientation period. If the groups change over the summer, the early students may not be reliable predictors of how the presentation would be received over the entire period.

Too cool for school: Another striking characteristic of the groups was the level of peer consciousness that we saw in the groups. This was especially true in the early groups where a lot of people knew each other. Essentially, material we had tested with student groups, like the orientation leaders, and knew to be humorous could get a great range of reactions, depending on the group. If one person laughed; everybody laughed. There was a great deal of pressure within the groups to conform.

The major effect this had on the presentation, as discussed above, was a rethinking of the expectation that the groups would engage in meaningful dialogue prior to answering questions.

'Cheesy' is in the eyes of the beholder: Empathy with the audience went a long way to making the presentation a success. One way we found to develop empathy was to assure the audience that the videos were too 'cheesy' for a sophisticated group, like our orientation classes. Clearly, at one level this was true. The students, as a group, are very sophisticated, especially technically and the videos are not done by professional actors and are very simple productions. At another level saying to the students that, 'you are handling this orientation in a very sophisticated manner', helped develop camaraderie between the presenters and the audience. It also gave them implicit permission to kick back and enjoy the inherent goofiness of the presentation. If they were willing to take the material at face value and focus their attention, we would be able to leave an impression on the students.

Distractions: In a very real sense, the students were as sophisticated as we told them they were. Our biggest issue is the time slot in the second morning. We ended up with a certain percentage of students too tired to pay attention. But that wasn't very distracting. The questions we were asked indicated that the level of the material was not overwhelming. The questions were well thought out and flowed naturally from the material. As the summer wore on we wove more and more of the common questions into the fabric of the presentation itself.

Attention span: We found that shorter, simpler presentations worked better. The need to have shorter, more direct messages was a product of the students being overloaded with information during the orientation period. We re-edited the videos once to shorten them and punch them up. This cut the time on the videos by half a minute.

Other Venues

Graduate Orientations: Along with undergraduate orientations, we participated by doing live presentations at the Law School, the Medical School and the College of Art and Architecture. We tailored specific presentations for each of these environments. We worked with the chief information technology person at each of these colleges to make the presentation relevant to their students. The time we were allocated and the issues each school wished to emphasize determined how we approached each orientation session.

Each of chiefs of information technology had different opinions on which of the videos were appropriate for their student groups. We addressed password security with each group. Hence, we showed them all the 'Geri Swinger' video.

Since we had only 10 minutes with each Medical School group, we addressed password security; discussing social engineering aspects, how to set a password that was hard to guess, and how to combat scanning.

We had 30 minutes with the Law Students. We only showed 'Geri Swinger' video, but we discussed all of the key issues. We talked about e-mail usage (and groups) and copyright. This presentation addressed the legal environment for e-mail (including privacy rights) and copyright (focusing on the Digital Millennium Copyright Act and Fair Use provisions).

With Art & Architecture, we were given a 45-minute time slot. This allowed us to show all three videos and address some things in greater depth. We expanded the presentation to include more detail on First Amendment Rights and the theoretical basis for U-M's policy of not monitoring e-mail. Additionally, we addressed 'Fair Use' provisions with the Graduate Students, as well as how to protect their own work. Both of these topics were deemed too complex to address in the 20 minute undergraduate presentation.

Transfer & International Students: Along with live summer orientation presentations, we were asked to provide information packets for an additional 1600 graduate and transfer students. Even though we were not able to speak to these groups, we were able to get our message out to another significant piece of the community.

Parents Orientation: We were also able to give a small group of parents a chance to sample the videos and briefly discuss 'Smart Computing'. The parents were a receptive audience.

Lessons Learned

Snappier, punchier, shorter: The technique of overlaying text on the videos to help set the scene and bring out key issues will need to be further exploited in the future. It simplifies presentation immensely and makes the video messages more accessible. Further, the aim for future productions will be a maximum of 3 minutes. We will further concentrate harder on the main message and not muddy the water with setup.

Check the humor: One of the most interesting things that we learned from this year's orientation was to make sure to check that the humor translates to today's college students. In the 'Founding Fathers' video, we include a joke about *the old gray mare not being what she used to be*. This was a reference to the old folk song 'The Old Gray Mare'. When writing the script, we assumed that the song was part of the popular culture. We previewed the videos with groups of staff people and the overwhelming majority got the joke. During the summer we showed the videos to 5200 students and not one did. In the future we need to see that the assumptions made on what is humorous need to be checked. The student reviewers were asked if they understood the script – which they did. But, the right question was 'do you get the joke?'

Use catch phrases: One of the biggest lessons learned was that creating the vignettes went a long way toward leaving a lasting impression on the students. We do however need to do a better job of creating a simple, direct message which can be conveyed in a simple catch phrase that students can carry with them from the presentations to remember the concepts presented.

Planning for the Next Orientation

New issues: In the areas of security, policy and ethics, there are a number of key issues we want to address. As part of our educational efforts, we are attempting to create new video vignettes on different topics. We are planning to address internet hoaxes, providing personal information online, fair information practices and accessing pornography in this manner. We are hopeful that the lighter touch used on this year's videos can be extended to the new topics. It is our hope that we can provide guidance to users on serious topics without overly frightening our users or discouraging them from ethical use of technology.

Conclusions

We feel that we made a lot of progress with the 'Smart Computing' presentation in 1999. We moved to a more interactive presentation style. The videos were a success and it is our intent to continue creating vignettes in that media. They are especially useful because they can be reused and repackaged for other educational venues. We did a better job of capturing attention than previous years and we were able to leave a lasting impression on are audience, evidenced by an article in the *Michigan Daily* three months later which referred to our part of the orientation as a shared experience.

We also learned that there are a lot of things that we can get better at. The key to these is student involvement in everything from writing scripts and testing the humor to more carefully tailoring the message to the learning styles and preference of today's students. We learned that if you can make the messages fit the learning styles of the audience, they will care, they will participate and they will remember the important parts.

Endnotes

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Transforming Education Through Information Technologies

Abstract

Category: Papers Presented at EDUCAUSE annual conferences

ID Number:	EDU9915
Title:	A Data Warehouse Solution Using University Consortia and Business Outsourcing
Author:	Harold George, Gerard A. Dizinno, Susan Ramsey
Organization:	St. Mary's University, The Intellisolve Group, Inc.
Year:	1999
Abstract:	The idea of data warehousing to provide information effectively and efficiently within organizations was initially developed in the for-profit business arena. Relatively recently, institutions of higher education have begun to develop data warehousing solutions for their information needs. As a way to develop both a "state of the art" data warehouse, a consortium of higher education institutions joined with two business partners. We believe that the solution arrived at is both economically advantageous and technically desirable -- and may be the most effective way for small to midsize institutions to benefit from this technology.

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A Data Warehouse Solution Using University Consortia and Business Out-Sourcing

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Abstract

The idea of data warehousing to provide information effectively and efficiently within organizations was initially developed in the for-profit business arena. Relatively recently, institutions of higher education have begun to develop data warehousing solutions for their information needs. As a way to develop both a "state of the art" data warehouse, a consortium of higher education institutions joined with two business partners. We believe that the solution arrived at is both economically advantageous and technically desirable - and may be the most effective way for small to midsize institutions to benefit from this technology.

Introduction

What is a Data Warehouse?

Inmon (1993) was among the first to describe the idea of a data warehouse in response to perennial problems associated with institutional data management systems. Typically, institutions have several databases dealing with different aspects of the university's functioning. The result is a patchwork of systems designed to conduct different business processes, with no connection between them, either functionally or temporally. Yet, decision-makers require information that combines information in ways that make sense to them.

Perhaps the most succinct and clear definition of a data warehouse can be found in the recent monograph by McLaughlin, Howard, Balkan, and Blythe (1998), *People, Processes, and Managing Data*. In that work, the following citation explains a data warehouse:

> "A data warehouse is a collection of data from many systems brought together to support the needs of management. It is a 'user friendly' version of the institutional research collection of census-date data sets."(p. 49)

The term "user friendly" is especially important, since developing relational databases combining information from many sources is possible. In our experience, however, those new databases still required special skills in report-building to make the data accessible to most users. McLaughlin, et al.

(1998) goes on to explain the four basic problems that a data warehouse addresses: data access, data integration, data availability, and data integrity. These four issues were of great import on our campus and are addressed below.

Data warehouses have the following characteristics (McLaughlin, et al., 1998):

Subject Oriented

Organization is around subjects, like students, faculty members, etc., rather than administrative functions like the payroll, registration, etc.

Integrated

Warehouses bring together information from multiple transactional systems to form one integrated whole.

Nonvolatile

Transactional systems are dynamic/volatile, in that the data can change, literally, from moment to moment. This is valuable for a transactional system, where users need up to the minute data. It is not desirable, however, for most institutional research or management purposes.

Time Variant

The data in a data warehouse are time-stamped. They are not "updated," but remain in the warehouse for an agreed-upon length of time. New data are added, with new time-stamps, at regular intervals depending on the management needs of the organization.

St. Mary's Context

St. Mary's University is a moderately sized (about 4,200 students), Catholic university, in the *barrio* of San Antonio Texas' west side. Our undergraduates are 65% Hispanics (primarily Mexican-American) and female (about 60%). We are the largest Catholic University in the southwest, and have been in existence since 1852.

Approximately 180 full-time faculty members and 300 administrators and support staff work at the university. We, like many private, Catholic, universities are highly tuition-dependent, and budget funding for all requests each year are difficult to fund. Computer and information technology needs are great, especially on the academic side of the university, and staffing in computer-support positions is small. Administrative computing currently has three full-time staff members and two student assistants. These individuals are responsible for all maintenance and upgrades of hardware and software, development of new applications, and orientation/training of administrative system users.

Despite the size of our institution, however, the needs for accurate and timely information for decision-making are similar to those seen on larger campuses. We are required to provide the same level of governmental reporting, we choose to provide data for the same surveys and other requests for information (e.g., U.S. News & World Report) and, more important, we need to make the same smart decisions as our larger "cousins."

The problem that many institutions of our size face is that while we have similar information needs as do larger institutions, we have far fewer resources on campus to provide this information. As noted above, our IT staff is small, our budget is limited, and there are more than enough "basic" tasks to accomplish in each day to keep everyone busy.

Information Needs

The following describes St. Mary's situation, using the McLaughlin; et al. (1998) schema regarding the four basic issues that data warehouses address.

Data Access

For McLaughlin, et al. (1998), they discuss data access in terms of documentation/definitions, security issues, and hardware/software inconsistencies. The university has a sophisticated transactional database, the CARS Information System, which has, usually, reduced these access problems, but they do exist sometimes.

Data Integration

The CARS information system is based on an Informix relational database, with more than 600 tables and more than 6,000 data elements, related to every aspect of university functioning. It is, we feel, a superior transactional system, but its sheer complexity makes it inaccessible to all but the most sophisticated users. In addition, integration of information across tables also requires a great deal of expertise.

Data Availability

At St. Mary's, especially over the last five years, we have experienced a dramatic increase in the expressed need for information. Since our transactional system, CARS, requires a high level of sophistication regarding its organization report-writing ability, only few users on campus outside the administrative computing staff are sufficiently expert enough to use the system

Data Integrity

Since data change from moment to moment, reporting different results for the same query in transactional systems is possible for two equally sophisticated users. Thus, one is always faced with the question of, "Do I have accurate results?" associated with every report. An additional issue that we faced at St. Mary's is that many different individuals engage in data entry without any real "vested interest" in the integrity of the data entered. By "vested interest" we are referring to a situation where everyone involved knows that the accuracy of information provided has serious consequences for decisions that they might make based on that information. If individuals never see the "results" of one's efforts as reports, analyses, etc., then they never develop this "vested interest."

Development of a Data Warehouse at St. Mary's

At St. Mary's, two specific information needs served to proximately stimulate the development of a sophisticated data warehouse. The first of these was the ongoing desire to adequately analyze the patterns of, and reasons for, retention/attrition among our undergraduates. Efforts in the past were limited due to difficulties in using our transactional system for this task. We created a "mini" data warehouse, designed specifically for the purposes of retention analysis, and used successfully for over a year. The success of that system served to stimulate others in administration regarding application of the same type of solution to their own needs.

The second stimulus for development of the current data warehouse came from a series of frustrating attempts to conduct accurate cost analyses for academic departments. Our Vice President for Administration and Finance served to emphatically define the problems and the data required to conduct such an analysis. Because of his involvement, the data warehouse project took on new, larger, dimensions, and this acted to convince many "doubters" that they needed this solution at our university.

How Should Development of the Warehouse Proceed?

For St. Mary's, once we decided to engage in development of our "mini" warehouse, we were faced with the question of how to do it. Two obvious choices existed: in-house development or outsourcing.

The In-House Option

In trying to decide the answer to this question, the issues of workload and costs were considered. Given the small number of full-time staff in administrative computing who were already more than fully occupied with a host of other tasks, we had two choices if we decided to use in-house development. First, we could take staff members from other, important tasks, and charge them with developing the warehouse. This solution was unacceptable since it would not only diminish service to other areas, but also would require significant training for our staff who were not hired with data warehouse-building skills as part of their job descriptions. Second, we would have to hire at least one new full-time administrative computing staff member, devoted solely to data warehouse development and maintenance. In pricing-out this option, we found that the annual investment for such an individual, including salary, benefits, and other support needs, would be more than $80,000 per year. This appeared very costly, especially for the "mini" system needed at the time.

Outsourcing

The notion of outsourcing key university functions is not new. Food services and bookstores are probably the two most frequently outsourced functions on campuses across the nation. In addition, some university's are experiencing success in outsourcing residence hall management and financial management (billing, the payroll, etc.). The advantage of outsourcing is that an institution does not directly pay for the salaries, benefits, or training needs of the individuals who are managing the project. The downside can be, of course, is the lack of direct management that results. We can reduce this disadvantage, if not eliminate it, by establishing close connections and communications between the vendor and the university's administration.

At St. Mary's we had prior positive experiences in outsourcing small projects within the administrative computing area prior to the data warehouse project. Our business partner in some of those endeavors was The Intellisolve Group, Inc., a local company that was of great help in our data warehouse solution.

The Initial Solution: Retention/Attrition Warehouse

As noted above, a major development toward a comprehensive data warehouse was the development of a warehouse designed, initially, to help in reporting and analysis of retention and attrition. Partnering with Intellisolve, we were able to complete this relatively small application in less than six months, from initial identification of data elements to complete functionality. The first cohort extracted for the warehouse were students in the fall semester of 1997.

As it turned out, this application was useful for more than only retention analyses. The registrar used it for assistance in producing IPEDS data. The office of Planning and Institutional Research also found many ways to use the system. This warehouse was limited to undergraduates, with associated data. Plans were put in place almost immediately to upgrade this portion of the warehouse to include all other students (graduate students and law students). The upgrade of what we now call the "student" component of the data warehouse was completed for the Spring, 1999, semester.

Partnerships

It became apparent to us that to develop our warehouse more fully, we would have to involve not only our business partner, Intellisolve, but other universities and businesses. We believed, and we feel it has been confirmed, that involvement with other partners would not only be cost-effective, but would also result in our being able to take advantage of expertise that we would not otherwise have access to.

Our retention warehouse used software from the Cognos Corporation: Impromptu and Powerplay. We arrived at an agreement with Cognos for a site-license for these software products, which greatly helped in keeping the costs down. These products are desktop solutions that allow access to many individuals. Because they are Windows-based, users familiar with other Windows products more intuitively learn them. This enables us to reduce training costs.

The third partnership component was with CARS, the organization that builds and maintains our transactional system. Seeing the importance of developing a data warehouse solution that was compatible with their system, we partnered with them and they helped us in development.

The last part of our partnership was, perhaps, the most important. This was to form partnerships with other universities. Thus, we could draw upon not only their expertise and experience, but also to profit from hearing the kinds of analyses they contemplated and questions they wanted answered. Or university partners are Moody Bible Institute, in Chicago, Illinois, and Point Loma Nazarene University, in San Diego, California.

The Current Warehouse

Currently, as noted above, we have a complete student warehouse. In addition, we have developed a course-based component. We are developing applications to deal with potential donors (for development purposes) and with potential students (for admissions purposes). The software allows for three "levels" of reporting. First, *ad hoc* queries can be produced via Cognos' Impromptu software. Second, on-line analytical processing (OLAP) is possible using Powerplay. OLAP provides for accessible and timely analysis of information based on the development of business "dimensions." These dimensions are aspects of the university that are especially relevant to decision-makers, such as students, time dimensions, geography, courses, etc. The software allows for easy manipulation of rows and columns of the tables produced, substitution and addition of dimensions, and various tabular and graphical output display options. Lastly, the software can be utilized to provide what traditionally would be considered executive information systems (EIS). In this sense, certain important reports are saved and updated automatically for quick and easy viewing and some manipulation by higher-level administration, such as Deans, Vice Presidents, or the President. One can consider these reports as sophisticated "briefing books" for these administrators.

Cost Analysis

As noted above, our initial foray into data warehousing showed to us that the costs of staffing and staff development were not reasonable for our institution. We believe that this is the case for many small to moderately sized institutions whose budgets, especially in technology support, are very tight. So far, the *total* cost for our system is less than $100,000 - a relatively small amount when one considers that to reach this point on our own we would have needed at least one full-time person over two years (over $100,000). Also, we are now in a much more "flexible" situation with regard to future expenditures. We expect that if we continue out-sourcing that our costs will not be higher than what we experience per year, and very well might be lower per year. Or, we have the option to reconsider our staffing options and perhaps get a part-time individual to do warehouse "maintenance" - a task that Intellisolve currently handles - and use this business partner only for new development options.

Summary

After trying to utilize our transactional system for years in order to assist in management decision-making, St. Mary's University decided, in 1997, to engage in development of a data warehouse - initially for undergraduate student analyses and reporting. Currently, we have expanded the student component to include all students, and have added a course-based component as well. We are in the process of including donor/potential donor-based and potential student-based components. All of this development has occurred because of our successful partnerships with businesses (Intellisolve, CARS, Cognos) and other institutions (Moody Bible Institute, Point Loma Nazarene University). We believe our solution is cost-effective and allows small to moderately sized institutions the ability to have a sophisticated data warehouse solution.

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Transforming Education Through Information Technologies

Abstract

Category: Papers Presented at EDUCAUSE annual conferences

ID Number:	EDU9901
Title:	A Dynamic and Individualized Web System
Author:	Christopher G. Connolly
Organization:	Villanova University
Year:	1999
Abstract:	Many universities have striven to provide their students, parents, faculty, staff, and alumni with robust, useful, and informative websites. This paper is designed to evaluate the evolving web-based technologies and will utilize Villanova University's work for case-study examples of these technologies. The objective of this paper is to provide the reader with a better understanding of what constitutes a truly integrated, dynamic, and individualized web system.

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A Dynamic and Individualized Web System

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Many universities have striven to provide their students, parents, faculty, staff, and alumni with robust, useful, and informative websites. This paper is designed to evaluate the evolving web-based technologies and will utilize Villanova University's work for case-study examples of these technologies. The objective of this paper is to provide the reader with a better understanding of what constitutes a truly integrated, dynamic, and individualized web system.

Introduction

Many universities have striven to provide their students, parents, faculty, staff, and alumni with robust, useful, and informative websites. This paper is designed to evaluate the evolving web-based technologies and to provide case-study examples of the latest technologies. By its conclusion, you should have a better understanding of what constitutes a truly integrated, dynamic, and individualized web system.

Villanova University has spent the last twelve months overhauling its static website to a dynamic and individualized web system. At the outset of the project, the term "portal" was adopted by the industry, and its methodologies were found to accurately describe many of the objectives that the University wanted to achieve. This paper will properly define the term "portal" so that one can distinguish between it and an advanced Intranet system. Let us begin by examining the differences among Internet, Intranet, and Portal technologies.

Internet Website

Internet websites are the most basic web technology, usually providing static information through HyperText Markup Language (HTML). HTML Forms, JavaScript, Java, ActiveX, plug-ins, and Common Gateway Interfaces (CGIs) provide means to "liven" a website and provide dynamic, real-time information. However, since the Internet is accessible by consumers worldwide, developers are limited in what new information and systems they can provide without violating the security and privacy of customers.

Intranet Website

Intranet websites provide more robust, useful web-based solutions to specific customers and internal staff through user-based authentication. However, Intranets have some drawbacks. For example, end-users must remember many different usernames and passwords for each Intranet. Perhaps the greatest problem with Intranets is their inherent separation from Internet websites due to security concerns. Thus, end-users must be instructed to utilize Internet websites for public information and Intranet websites for restricted information. This dichotomy causes a development burden because several websites must be maintained, possibly even repeating the same information.

Portals

Portals were designed to organize and customize the plethora of information available on Internet and Intranet websites and to provide a single point of entry. A good portal provides seamless access for non-authenticated end-users until sensitive information is requested, then prompts for a username and password. Authenticated or known users, through the use of cookies, are presented with a more individualized view of the organization's website.

There are, however, many products on the market today that are simply advanced Intranet websites that take better advantage of information known about the end-user. These portals can fail developers by requiring them to maintain an Internet website for non-authenticated users and a portal for authenticated users. For example, storing a university's student campus activities schedule in a password-protected portal prevents prospective students from viewing the activities the university has to offer, while placing the activities schedule on the public Internet site prevents university web designers from personalizing the information. One example of personalized information is placing sophomore activities at the top of the schedule when sophomore students view the content.

Unlike Internet and Intranet sites, most portals do not conform to any standard and thus are often proprietary. Although they may provide Application Programming Interfaces (APIs), each provides a different set of APIs. Portals are meant to be a solution for multiple Intranet username/password systems, which are based on many open standards; however, more vendors are offering portal solutions for different functional needs, such as Athletics or the student record system. What is the solution once an organization has several different vendor-based portals?

In-house vs. Commercial Portals

One of the challenges to an organization is determining whether to develop an in-house software solution, out-source, or purchase a commercial solution. The organization must assess the need for a competitive edge over the competition in the technology arena, the ability of an off-the-shelf product to meet those unique needs, and the resources necessary to develop an in-house solution. The Netscape browser is a good example of a technology that meets almost any organization's unique needs. Most organizations, with the exception of competing browser vendors, gain little to no competitive edge by developing their own custom-built browser. Advanced, underlying technologies such as Web browsers, Java, e-mail, httpd, and LDAP are good examples of open standard solutions that generally should not be developed by organizations that are not specialized in these technologies. However, CGIs and Java Servlets are programming interfaces developed to allow organizations to develop custom applications. Writing a Java Servlet that displays the photographs of the students enrolled in a course by bringing together information from Vendor A's student record system and Vendor B's Picture ID Card system is a good example of an in-house application.

Are portals an advanced, underlying technology such as httpd or an applied technology based on existing technologies? The answer is that portals are an applied technology application based on existing technologies. Today, most portals are simply several underlying technologies packaged together. It is important to realize that portals themselves are not unwieldy to develop. The organization must assess its situation to determine whether to develop a portal that will provide a competitive edge over the competition or whether to purchase a commercial solution that will allow it to focus on other issues. Universities should be cautious of commercial portals geared towards universities priced at an incredibly low rate. These companies have realized that university students represent one of the most powerful demographics with respect to advertising. A vendor sells its product to a university at a low cost by displaying advertisements on the portal pages. Vendors may convince a university that portals are too advanced for the university to develop on its own and that commercial or non-advertising portals would cost between $100,000 and $1,000,000. The fact is that all but the smallest universities that lack IT resources may wish to seek a non-advertising solution or develop its own.

Preliminary Steps for Portal Integration

After an organization has decided whether to develop in-house or purchase a commercial portal, the following steps must be completed. Some of these steps come with a commercial product. For each step listed below, an example of how Villanova University approached and resolved that step is provided.

Centralized Usernames and Passwords

It is essential that a system of centralized usernames and passwords exists. There is little point in providing powerful web tools if end-users do not know their usernames and/or passwords.

Villanova University Case Study

> Villanova University chose Netscape's Directory or Lightweight Directory Access Protocol (LDAP) Server for its central repository of usernames and passwords. LDAP is an open standard protocol that is compatible with many commercial and freeware products, reducing development and integration costs. Sun Microsystems provides a Java Naming and Directory Interface (JNDI) for LDAP, supplying an open standard of APIs for our username and password solution. Currently, Villanova's Remote Access Server (Merrick Radius Server), Netscape Proxy Server, Apache Web Server, IP Registration System, Netscape Usenet News Server, Netscape Messaging Server (E-Mail), Netscape Calendar Server, Microsoft FrontPage, and Novell Servers are linked to the LDAP system. With the exception of the Novell Servers and FrontPage, all of these systems talk natively to LDAP, requiring no code development to integrate. Using either Netscape's LDAP to Windows NT or Novell's Netware to Windows NT integration, Villanova plans to integrate its Windows NT environment into its centralized username and password system. Villanova required fewer than 12 months to build and integrate its centralized username and password system.

Centralized Customer Record System

In order for a portal to communicate effectively and efficiently with students, faculty, staff, and alumni it must know as much as possible about each individual. If a university operates on different system for payroll, students, and alumni, it becomes a difficult hurdle for a portal to overcome.

Villanova University Case Study

> Villanova worked to centralize its operations into a single database system. SCT's Banner system was installed five years ago and most departments are now integrated. The IT department's helpdesk system, University Card system, and Telecommunications billing systems are examples of departments using databases that are not integrated into the central record system because the needed functionality was not offered by the vendor. The helpdesk and University Card systems have been linked with the LDAP system so that information can be retrieved from these systems with minimal effort.

Centralized Repository of Relevant Information about Customers

Although a university may have a centralized customer record system, it is often too complicated to easily develop web content. A relational database solution might have a customer's information stored in twenty or more tables. Filtering through these tables when attempting to customize the look-and-feel of a webpage for an end-user would be time-consuming both to develop and to execute. In addition, it is likely that the portal will need to store and manipulate its own information that the record system may not be readily able to handle. There are two key issues to consider when centralizing information into a central repository system: what information needs to be warehoused and how is that information kept up-to-date. For example, if the portal records that a student is an Engineering major, how is the information updated for the portal's centralized repository to reflect that the student transferred to Commerce and Finance. A repository may also be necessary if the centralized record system must be brought down once a day for backups. Most customers want their websites to be up twenty fours hours a day, seven day a week, so it is important that the portal can access its information 24-7. Repositories may be stored in simple database tables, a directory server such as Netware or LDAP, or object-oriented databases.

Villanova University Case Study

> Villanova chose LDAP as it central repository for relevant customer information. College, major, class year, permanent address, campus address, phone number, department, and University card photo are just a few examples of the information stored in the LDAP server. Information from the University record system is updated into LDAP in one of two ways, via a nightly sync process or a

database event listener. The nightly sync process checks each LDAP account's information against the information stored in the University record system and updates any necessary information. The database event listener listens to relevant tables in the record system, such as the address table, and fires an event when a change occurs. The triggered event is then processed and the information is checked against LDAP. This process provides real-time updating while the nightly sync process "catches" any changes missed during the day or as a result of downtime.

APIs and Documentation for Repository

In-house developed or commercial Portals should provide an API and Documentation for the information in its storage facility. The API allows a university to customize and tailor the information to its needs. In addition, a properly constructed, object-oriented API can provide a robust and resilient interface. For example, to access a database table requires a raw Structured Query Language (SQL) statement that is not very resilient to future upgrades and modifications. An API with simple getters and setters, such as getUserID(), provides a much easier to use and robust interface to the information. Although the APIs may use standard programming structures such as JNDI or Java DataBase Connectivity (JDBC), the methods provided for each are not standard across portals. Case in point, vendor A's portal may have a getUserID() method while vendor B's portal may use a getUsername() method. These discrepancies can be a major hindrance and cause portals to become no more than high-end Intranet products. For in-house developed portals, documentation for the API and the underlying code itself is required.

Villanova University Case Study

Because Villanova developed its own repository using LDAP, it had to develop its own API and Documentation. The API, written for Java programming language, and documentation is made available to any department or college within the University that wishes to use the information. Often the API has been used for non-web related projects, such as configuring end-user Windows machines to reflect their username, location, workgroup, etc. The API is currently in its second generation; it is easier to use and more object-oriented in order to be more resilient to change.

Integrate New Infrastructure

The above steps, including developing or purchasing the portal software, require a significant investment of time and money. The true cost-savings and benefits come into play with the fact that existing and new systems integrate into and take advantage of the new infrastructure. There is more to most universities than their websites. Combining resources like the web, e-mail, e-commerce, and classroom instruction to take advantage of the same individualized, "portaled" repository of information reduces administrative and maintenance costs and presents a more seamless environment for the customer.

For commercial portals, there are specialized and generic portals for integration. A specialized portal is a portal supplied for a specific target market or to extend an existing product. For example, a vendor may enhance its athletic recruitment database system by offering a portal that immediately integrates with its existing database product. However, a registrar's office will have difficulty utilizing an athletic office's portal for its own needs. A generic portal is a portal that is intended to be flexible enough to be used for any organization's needs. A generic portal, however, usually exists outside any of the existing systems of an organization. In this case, an in-house or out-sourced integration between the existing system and the portal is required.

Villanova University Case Study

Villanova has integrated many existing and new systems into its new IT infrastructure. Below is a list of the many system now integrated.

- Integrated E-Mail that provides customers with:
- Distribution lists by course
- Distribution lists by college, major, year, college-year, major-year

- Distribution lists by department and employment breakdown by staff, faculty, part-time faculty, etc.
- Integrated Usenet Newsgroups which now provide customers with:
- Employee restricted newsgroups
- Newsgroups for every course taught at Villanova
- Newsgroups for every college, major, year, college-year, major-year
- Newsgroups for every department and employment breakdown by staff, faculty, part-time faculty, etc.
- Integrated Apache Web Server with Frontpage Extensions
- Allows employees hired into a department to automatically have rights to edit and modify the departmental web content.
- Removes employee rights to edit department web content once they move to another department or leave the University.
- Integrated course list with Photo IDs

Enabling Individualized Web-based Solutions

After the infrastructure is in place and a portal has been developed or purchased, it is time to evaluate the customers' needs. Often many IT departments spend so much time and effort on designing the underlying infrastructure that they believe the dynamic websites are just extensions of their infrastructure. However, the opposite is true. The dynamic websites provide the information and tools the customer wants while the infrastructure exists only as a means to support such a rich system. A common feature of a portal's "My Homepage" is to provide sports updates. From a university point of view, the idea of a sports section seems quite trivial and irrelevant. From a student point of view, customized sports updates are a useful resource for the university web to provide. Universities that make sports updates available will not only increase customer satisfaction and portal usage, but also enable the university to place its own news and events around the sports section, increasing student awareness of campus activities and opportunities.

Villanova University Case Study

> Villanova's most successful portal tool has been its My Classrooms feature. My Classrooms provides a common link to Classroom material and resources that are available on the Internet. All University courses include an E-Mail Class Distribution List and a Class Discussion Newsgroup for faculty and students to collaborate throughout the semester. The "killer app" of the My Classrooms feature is the ability to view the photo ID of all the students enrolled in a course. This feature has been extremely well received by faculty members.

Developing and implementing the customer-needed features of a portal is only the first step of a properly deployed portal system. Typically, an IT department represents only a small portion of the workforce of a university. Therefore, it is essential that non-technical users outside the IT department can take advantage of the advanced capabilities of the portal system. The ability to incorporate security and dynamic features using customized HTML tags is one of the simplest methods for end-departments to take advantage of portal technology. A good portal should also be able to work with other existing web servers. It is very rare that an entire university operates on a single web server. Therefore, the portal solution should be extensible enough for other departmental web servers to take advantage of the portal technology.

Villanova University Case Study

> Villanova University has taken advantage of Java Taglets, which provide a way to implement customized HTML tags to interact with Java Servlets. This allows HTML developers to add security or dynamic content to their pages with simple HTML tags. It also provides a method to repeat dynamic information efficiently across different pages. For example, the University Library system can display the same dynamic Library News Module on the University homepage as well as on the library homepage.

Conclusion

Dynamic and individualized web systems will become essential for organizations over the next several years as customer expectations grow and as organizations further develop their web-based technologies in order to distinguish themselves from the competition. It is important not to lose sight of the origins of the Web, to provide a seamless, heterogeneous environment to access information, and avoid the "bells and whistles" of a proprietary portal solution. Villanova University has successfully integrated portal technology by constructing and utilizing a solid IT infrastructure.

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Abstract

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ID Number:	EDU9934
Title:	A Warehouse Design; Keeping it Simple
Author:	Scott Thorne
Organization:	MIT
Year:	1999
Abstract:	MIT has implemented a warehouse, which brings several elements of function and design together. MIT's warehouse supports reporting, and acts as a hub for data distribution between systems. We've tried to satisfy both needs with an open flexible design. We've restructured our information, which comes nightly from source systems such as SAP, for easier reporting. The warehouse has row level access control which is driven from an enterprise authorization system (Roles). Other design features are a metadata driven data conversion and load process, distributed report creation, encrypted transport, and a system of automated integrity checks and controls. This paper covers the major design points and some of our experiences implementing and maintaining a warehouse.

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A Warehouse Design; Keeping it Simple

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MIT has implemented a warehouse, which brings several elements of function and design together. MIT's warehouse supports reporting, and acts as a hub for data distribution between systems. We've tried to satisfy both needs with an open flexible design. We've restructured our information, which comes nightly from source systems such as SAP, for easier reporting. The warehouse has row level access control which is driven from an enterprise authorization system (Roles). Other design features are; a metadata driven data conversion and load process, distributed report creation, encrypted transport, and a system of automated integrity checks and controls. This paper will cover the major design points and some of our experiences implementing and maintaining a warehouse.

Introduction

MIT's data warehouse has been in existence for about four years, but only in the past year as we've added our SAP financial information has it reached maturity. Currently we have a thousand registered users who have about 3,000 sessions a month. We have Personnel, Financial, Purchasing, Telephone, Student, and Award information in the warehouse currently.

Vision

The basic vision of the Data Warehouse is to make information at MIT more accessible and easier to use. If people can get data easily, they will spend less time gathering information and more time analyzing it. Having information from several different sources allows people to create reports easily. Once similar reports would have taken days to construct. This allows time for information to be used in new and creative ways. In the past, even if individuals invested the time and energy to put together information for themselves, it was not easily shared. With the technologies available today, once a user figures out a good way to look at the information (by generating a report definition in BrioQuery, for example), they can easily share it with others.

By making information available in this way, users should be able to combine warehouse information with local information. This is a powerful concept, because it frees the users to keep track of the information unique to them, and not recreate information available in the warehouse. In this way the warehouse and local systems compliment each other. Making data more accessible also serves several other goals. First, it will improve data quality over time. As people use the data, errors can be corrected as they are found. Additionally, using the information for more purposes will help us improve the design of our systems in the future, so that we will have the information that we need on hand.

Definition & Functions

The Data Warehouse is a database with information coming from many areas, which is structured in a way to make it easy to use the information.

- Many Sources; integrates data from various administrative systems and stores them in one location.
- Read Only; is a read only database. Information represented in the warehouse is maintained in other systems, called "systems of record".
- Restructured Information; presents data in a simple form so that reports are easy to construct and the warehouse is easy to use.

The main purpose of the warehouse is a reporting and data distribution environment for Departments, Labs and Centers at MIT. In addition to this, the warehouse will support some of the reporting needs of Central departments. Also, the warehouse acts as a hub, to facilitate the exchange of information between systems. Taking all of these functions together, the warehouse serves as the enterprise information infrastructure.

The warehouse is not the place to solve problems like "Did this invoice get paid?" This type of question should still be directed to the transactional systems such as SAP. A warehouse system is not meant to take the place of the transactional system, but to complement it. It will take some training for users to understand when they should be using the warehouse and when it would be better to query the transactional system.

The goal is to put all administrative information in the Warehouse. The two basic requirements we have for determining which information goes into the warehouse are:

1. That the information is of use to more than one group of people.
2. That the information has a source system of record.

Since the community has diverse needs, the warehouse is being designed to support three separate access mechanisms:

> 1. End user query and reporting tools: MIT has obtained a site license for BrioQuery, one of a large number of commercial products in this area. Ad Hoc reports are very easily created. Standard reports can be defined and shared easily through the Web or an email attachment.
>
> 2. Creation of file extracts: Data files can be created and transferred using FTP'd from the warehouse to local systems. In addition database links, snapshots, and other database to database transfers can be done.
>
> 3. Custom programs: Programs can be written to access the warehouse using SQL. These can range from simple Perl scripts which just extract data, to full applications written in Powerbuilder, C, Java, etc.

User Engagement

We have a diverse set of users at MIT. Some people need to be able to just push a button to get the standard report they need. Others need to analyze information in a much more dynamic way; asking a series of questions (ad hoc queries) to investigate something. We tried to give users an easy way to get started, but put no limits on what they could do.

We don't expect all users to learn how to build reports themselves. What we hope to do is get users comfortable with running prebuilt queries. Then when the need arises, they can learn more and modify the reports to suit themselves. As users use and understand information they will start creating reports themselves, hopefully sharing this work with others.

A warehouse should ultimately change the way people use information. It takes time for this change to happen, and people change at different rates, so a warehouse needs to evolve over time. At the outset people want to be able to look at the information in as close to the same way as they've been seeing it. Allowing them to do this makes them become familiar with the warehouse, and have confidence that it is providing the same information they used to get. Later they can begin at their own pace looking at information in new ways, such as in new layouts, at different levels of aggregation, or in exception reports.

Pitfalls

Not restructuring data is one of the most common mistakes made in warehouse implementations. If you just move the data to the warehouse without changing the structure all you really achieve is off loading some reporting load from the transactional system. Some people make the argument that if you don't keep it the same how will you know that you've got an accurate representation of the source system? There are other ways to ensure integrity, and the benefit of doing this restructuring work initially will save enormous amounts of report development time and execution time, as well as allow mere mortals to construct queries.

Managing expectations is a pitfall in every IT development project, but a warehouse project can be worse in that it ends up as all things to all people. The variety of subjects, users and uses makes expectations hard to manage.

Scale and Operating tasks -- You need to plan for success. This cliché has real meaning in a warehouse project. Many people advice to get something out fast to get buy in. However, once you've demonstrated the value, users will quickly want everything in the warehouse. If you have not worked out scaleable processes for handling all the new data and users you won't be able to meet those expectations. Unfortunately this means taking more time up front to design processes that will scale. Another method which we ended up using, was to put something up initially to test our ideas, and then go off and figure out how to do it right. This leaves a gap in the delivery of new information, which needs to be explained to people before you start.

Design Points

The design of the Warehouse has many aspects. As in most designs the considerations need to be balanced. For example in the case of simplicity vs. flexibility and functionality, every time we provide alternatives we make the system a bit more complicated. A warehouse can get complicated quickly, so at all times you must strive for simplicity or things can get quickly out of hand. In each area of design we tried to keep things as simple as possible.

Easy to Use

The success of the warehouse depends on our ability to present the data in as simple a form as possible and to make interactions with the data warehouse as simple and straightforward as possible. To generate common reports, the end users will have access to data that are in an easy-to-understand and easy-to-use structure. Unlike a traditional transactional system, which minimizes the storage locations of data to make updates more efficient (normalizing), the data warehouse duplicates data where appropriate, so that reports can be generated more quickly and more easily. Although this strategy uses more disk space, it makes reporting access much easier and faster.

Star Schemas

In particular, we've organized the information in star schemas. Star schemas consist of a central fact table joined with several dimension tables. The fact table is extremely large and has all the transactional data and numbers, the dimension tables are smaller and have descriptive information. An example of a fact table is our financial_detail table. Examples of dimension tables are time_month, gl_account, cost_collector. The dimensions allow a user to sort, group and limit the fact records easily. Since the dimension tables are smaller, the users can display all possible values of a field when deciding how to limit their request. Users use many of the same dimension tables with different fact tables, so although it initially can seem overwhelming most users can become familiar with one set of tables quickly. This type schema is both flexible and efficient.

Star schemas have other benefits. Since all the amounts and details are in the fact table, this is the only one that usually needs row level access control. The dimensions can be left open and viewable to anyone, since they have only descriptive information like cost collector names and numbers.

Another feature made possible be star schemas is a flexible way of viewing historical information. For example, when viewing old financial information do you want to see the numbers with the account information the way it was when it happened, or recast in the way your organized now. Since the descriptive information is in the dimension table it is possible to create snapshot versions of dimension records periodically. Then by joining the dimension table to the fact table using different key fields, you can get either view from the same fact table.

Quality of Information

The implementation of a subject in the warehouse goes through a progression of stages. These stages can be years long. The quality and usefulness of data improve through each successive stage of implementation.

- Getting accurate detailed data within a subject area.
- Integrating accurately detailed information among subject areas, e.g., combining Personnel and Payroll information.
- Creating useful summary, aggregate, and history information.

The quality of the information in the warehouse must be high for users to perform their reporting needs. There may be problems with data quality, because some of the data being delivered has not been accessible to the community before, and it has not been reviewed and corrected previously. Getting the data published and having a well-documented procedure for making corrections to data should go a long way towards making the warehouse information accurate.

Another problem with data is that we are attempting to combine information from several different sources. These source systems rarely had a need in the past to make sure their information was prepared to combine with data from another system. Therefore, problems such as having unique identifiers on records, or having several similar but different data elements will cause some problems. The solution is rethinking and altering of some of the source systems along with the warehouse, which will take some time to do correctly.

Because the warehouse is read only and not updated during the day, consistent reports can be generated from a stable data set. Users generating reports can be assured that they are obtaining information from stable data.

Integrity Checks

Knowing the information in the warehouse is a truly accurate reflection of the source system is extremely important, is people are going to rely on the warehouse for reporting. The warehouse implements several methods to try to assure this.

Users need accurate clear definitions of all the data presented in the warehouse if they are to make use of it. Beyond the definitions, they also need easy access to information concerning, for example, when the data was last loaded, where it came from, how to report errors, or how to get changes made to a particular field and record.

Open

Direct SQL access for users gives the Data Warehouse the openness (ability to use a variety of tools) and flexibility (putting information together in new ways. Many warehouses are designed with a front-end (such as the web), and no direct SQL access. Users will ultimately be limited in how they use the warehouse. Viewing information is fine, but many users actually need the data to manipulate further on their own or combine with local information. Using SQL doesn't preclude us from presenting the information via the web or some other front-end application in the future.

Metadata

Metadata or data about data is a critical component in a Warehouse environment. Metadata has many uses. Users need to know what data is available, how it's organized and what it means. Data transformation and loading tools or programs need to know where the data comes from and how it needs to change. There is an overlap here, both users and conversion programs or tools need to know the structure the data is going into. Since we were building our own tools, we also designed our own structure for maintaining metadata. In this way we do all the maintenance in one place and avoid problems of different representations of metadata which are out of synch. It also allows us to design programs for the conversion and loading of the warehouse, which are generic and get the specifics from the metadata. This allows for a lot of code reuse and minimal code changes as we make changes to conversions and loads. Most of the time we don't actually write new code to implement a new subject, it is only a matter of creating the metadata correctly in order to automate the loads with our existing generic programs. If an error occurs it most likely caused by either a data or metadata problem. The "metadata" makes it easy to change the way data is being loaded without having to recode. The same software gets reused in many different places making it unlikely that a problem would remain undetected in this area.

Access Control

Institute data must be handled with the proper security and access control. Information policies need to be worked out in advance and simplified as much as possible. Our warehouse design maintains security at the database level. All transmissions of data across the network is encrypted. Additionally, for users to view only the information they are allowed to see, such as their department's information, the warehouse will present most data through "views." With this scheme, users will see what looks like a table, i.e., "employees." However, in actuality, this is a view that shows each user a different set of data depending on the access control that has been granted.

This can be done by creating access control tables, which are joined with the base data tables in the view. The access control table would have the user's username as one field and some identifier in the other. The identifier would also be present in the base data table. The view would only select rows from the base table where the identifier matched the identifier in the access control table and the username matched the person connected. This way a single view definition could yield all Department B employees for Sue, while giving Tom only Department C employees.

Not only is the maintenance reduced, but this approach allows the users to share reporting templates and queries easily, since the objects they're using are the same. Because the access control table structure, and content is so simple these tables can be created easily or imported from another source. Using a view, which joins two tables, will impact performance, but this can work well on fact tables with millions of rows, and access tables with hundreds of thousands of entries, as long as the information is structured correctly.

Roles

Maintaining consistent access control mechanisms is a hard problem for most organizations. The variety of different systems sometimes containing similar information make implementing rational consistent access control hard. When each system has separate mechanisms for establishing access it takes a great deal of work to keep them in synch. In order to simplify this area at MIT, we designed a central authorization system called Roles. This system allows for the maintenance of authorizations in a single system. Then this system can drive the authorizations in both the system of record and the warehouse. In our case the financial reporting authorizations are maintained in Roles and fed to both SAP and the Warehouse always keeping them in synch. Furthermore, the interface for maintaining them can be distributed out to the departments, so that the people who know what the authorizations should be are maintaining them.

An enterprise access control infrastructure has the advantage of:

- Achieving consistent access control over multiple systems
- Distributing the maintenance of access controls to a person close enough to know and care whether the authorizations are correct.
- Having a simple way to maintain and view authorizations across many systems.
- Granting authorizations at the highest possible level, but enforcing them at a detailed level, which minimizes the changes to authorizations due to account or organizational restructuring.

State of the Warehouse

The warehouse is now enjoying some success. The usage has been steadily climbing this past year. More and more people are incorporating the warehouse in their normal work.

The central offices who are the information providers, are finding many benefits as well. They don't have to write and maintain as many feeds now, since people can get information directly from the warehouse. Also, having other ways to analyze their own data helps uncover problems sooner. Some of their common reports can be run against the warehouse in far less time, because of the more efficient reporting structures.

We're feeding many systems currently using a variety of methods, such as database links, file extracts, and Perl programs. Most of the maintenance of this is done by the person getting the feed and so as they need changes they can just do it themselves, since their program define the format, sort etc.

Next Steps

Most major subjects exist in some form with the exception of payroll. However, most subject areas cannot be easily joined to others. As noted earlier this was anticipated, and we will now turn our attention to this aspect of data administration. We also will be building better historical information, and creating some higher level summaries of existing information.

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Abstract

Category: Papers Presented at EDUCAUSE annual conferences

ID Number: EDU9917

Title: Admissions Process: Transformed with Technology

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Organization: Washington State University

Year: 1999

Abstract: Washington State University has completely revamped its student admissions process with strategic objectives of self-service information, paperless processing, and enhanced enrollment. The prospective student can apply for admission, view transfer credit reports, and track his/her admission status on the Web. All application material is stored in imaged form, and admissions staff process applications electronically using the stored images and automated workflow. Letters notifying applicants of admission decisions or missing information are automatically produced. Each student's virtual file is immediately available to academic advisors and others as needed. Use of the Web, imaging, and automated workflow has transformed the admissions process in ways not even imagined just a few years ago.

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Admissions Process Transformed with Technology

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Washington State University has completely revamped its student admissions process with strategic objectives of *self-service information, paperless processing,* and *enhanced enrollment*. The prospective student can apply for admission, view transfer credit reports, and track his/her admission status on the Web. All application material is stored in imaged form, and admissions staff process applications electronically using the stored images and automated workflow. Letters notifying applicants of admission decisions or missing information are automatically produced. Each student's virtual file is immediately available to academic advisors and others as needed. Use of the Web, imaging, and automated workflow has transformed the admissions process in ways not even imagined just a few years ago.

Introduction

Washington State University (WSU) is a Research I land-grant institution. Over 21,000 students are served from the main campus in Pullman, three branch campuses, numerous learning centers throughout the state, and an extensive distance education program. WSU was ranked the #1 wired public university by Yahoo Internet Life magazine this year. This ranking is relevant to the topic at hand because the excellent backbone network in place on our main campus, the educational network throughout the state, and high-speed access to the Internet helped make the implementation of Web, imaging, and workflow systems for admissions possible.

Strategic Administrative Objectives

The transformation of the admissions process with technology was carried out in the context of three strategic administrative objectives. One objective is to enable our students and other "customers" to get information from and/or conduct business with WSU as much as possible in *self-service* mode. With today's technology, this translates into putting information on the World Wide Web for easy, anywhere, anytime access. It also means collecting information and conducting business transactions on the Web. Several Web services were developed to aid the prospective student prior to and during the admissions process. These were directed at the prospective student learning more about WSU, planning an academic program, applying for admission including payment of the application fee, and tracking admission status. These services will be discussed in more detail below.

A second strategic administrative objective is to move to *paperless processing* as much as possible. The inherent problem with paper is that unless multiple copies are made, it exists in only one place at any one point in time and is not easily shared. The Admissions Office filing cabinets stuffed to overflowing, the stacks of paper application documents piled high on desks, and the need to locate a file to answer a student's question on the phone all pointed to a paperless admissions process as a great improvement in both processing efficiency and customer service. The solution explored and then implemented was a document imaging system with automated workflow. This is also discussed in greater detail below.

A third objective for the university is enhanced enrollment, i.e., improvement in both quantity and quality of students enrolling at WSU. With the younger generation having grown up with technology, high-school students now expect to gain information and do business with colleges and universities on the Web. Some do not even bother to apply for admission to an institution where the application form is not available on the Web. A similar situation exists for potential transfer students. They need to know information about transferring their coursework and expect to have an easy way to apply for admission. Ease and convenience for the "customer" is essential for any university to compete for today's prospective students. Customer services on the Web is the answer. Another factor in competing for high quality students is how long it takes to process applications and offer admission. A student is more likely to enroll at the institution that responds quickly with an admission decision. Our document imaging and automated workflow processing systems address this issue as well.

Web Services for the Prospective Student

Informational Pages: The Office of Admissions put a great deal of effort into revamping their Web home page and accompanying informational pages. These now include links to video clips describing a range of student services, information on campus visit programs, as well as everything a prospective student would ever want to know about applying for admission to WSU. An Information Request Form is available on the Web for those who would like information sent to them about specific programs.

Cougar TRACS: Cougar TRACS (TRAnsfer Credit System) is the winner of the EDUCAUSE Best Practices in Higher Education Information Resources award for 1999. Featured on WSU's prospective student page, it helps the potential transfer student to plan his/her transfer to WSU. The student has real-time access to degree program planning tools and Web reports to see how the courses he/she has already taken (or plans to take) apply toward any of WSU's degree programs. This system makes available to prospective students the same transfer articulation rules and degree program requirements used by the student records offices and currently enrolled students.

The Cougar TRACS site asks first-time users for a limited amount of personal information. An "Access ID" is assigned programmatically based on the student's last name, and the student then selects his/her own password. The main menu provides button selections for the student to enter course work from any institution in the transfer course database or to update personal information. The student can request individualized degree program requirements reports for any degree offered by WSU, and these reports will be returned immediately to the Web. The degree program requirements reports can show courses that the student still needs to take either by WSU course numbers or by course numbers at the student's transfer institution. The student may enter additional course work at any time and use the site for ongoing planning during his/her entire academic career prior to enrolling at WSU.

An additional feature of the web system is access to the prospective student's transfer information by an academic advisor. Once the student makes contact with a WSU advisor, the advisor can request the student's Access-ID (not password), then (using the advisor's password) view the student's course work and receive the same degree program requirements reports for advising purposes. Another web site, Transfer Course Equivalencies, can be used by prospective students, advisors, and others to determine equivalencies for individual transfer courses, or sets of transfer courses, from hundreds of different transfer institutions. Behind the scenes for both Cougar TRACS and Transfer Course Equivalencies lies WSU's implementation of DARS, the Degree Audit Reporting System from Miami University of Ohio. Cougar TRACS may be viewed on the Web at www.wsu.edu/transfer/TRACS, and Transfer Course Equivalencies at www.wsu.edu/advise/transfer-courses.

Application for Admission: Prominently displayed on the WSU home page as well as the Admissions Office Web pages is the link to the online admission applications. Two options are offered there. Each application form is available in PDF format to be printed off the Web and mailed in together with a check for the application fee. The second and much preferred option is for the applicant to fill out the form online and pay the application fee by credit card.

Seven different application forms may be filled out and submitted on the Web: freshman, transfer, international, former WSU student, non-degree, post-bachelor's degree, and graduate school. The six undergraduate applications are designed with a preliminary section where the applicant enters information that both assures he/she is using the correct form and determines the remainder of information asked for. For example, the freshman applicant is asked if he/she is currently attending high school or has completed high school. Those that are still attending high school will be asked for their senior year coursework, as that will not yet appear on their high school transcript, whereas those who have finished high school will not be asked for that information. Also, the preliminary form asks which campus the applicant is planning to attend, so that the appropriate list of majors and interest areas offered at that campus is shown.

In addition to using a preliminary form to determine the content of the actual application form, two other major decisions needed to be made concerning the Web design. One design decision was whether the applicant would complete the form all in one sitting, or be able to start the application, save what had been done, and return at a later time to complete it. The "one sitting" alternative was chosen, with additional web pages developed to tell the applicant what information was needed to complete the application before he/she started filling it out. A similar decision was reached over whether the application form should be presented in sections, with the applicant advancing one section at a time, or as one long form. The decision here was to present one complete form, with the exception of the preliminary information page, so that the applicant could see all of it and get a feel for what he/she would be asked for. An extensive help page is available when filling out the form, and may be read ahead of time if so desired. These design decisions have held up very well, with many favorable comments received from Web applicants about their experience in filling out the form.

Several policy decisions also had to be made early in this project. WSU requires the applicant's signature on the standard paper admission application form. Student Affairs sought and gained approval from the Attorney General's Office to display a certification message and request the applicant to type his/her name and the date following that message. As long as that information is entered, the form is considered "signed".

Another policy decision involved payment of the application fee. WSU requires that a $35 application fee be paid before any processing of the admission application is done. If we allowed the applicant to fill out the Web application form but then send the application fee payment by mail, there would be the added staff burden of holding the application and matching it up when the check arrived, all before any processing could be done. It was decided instead to require payment by credit card on the Web at the time the completed application was submitted. This way Admissions staff could begin processing Web applications immediately with assurance that the application fee had been paid. This was accomplished very easily by using the credit card service that was already in place for student account payments. The application fee payment section precedes the certification section on the application form. An additional page describing the secured network communication environment used at WSU helps alleviate any concerns about entering credit card information on the Web.

With very little publicity, online Web application forms have been an outstanding success. The graduate application was first made available in August 1998, with the undergraduate forms rolled out between November 1998 and March 1999. Looking at undergraduate applications for Fall term of 1999, 20% of the applicants filled out the form on the Web and paid by credit card, while another 8% printed the PDF form off the Web and sent it in the mail with a check. We expect these percentages to grow quickly as WSU advertises that Web applications are available. Web application forms and instructions can be found at www.wsu.edu/admissions/apply.html.

Advance Tuition Payment: WSU encourages admitted students to make a nominal advance payment on their tuition as a confirmation of their intent to attend WSU. Another link on the Admissions Office Web pages takes them to the Student Payments page where they or their parents/guardians or someone else on their behalf can make the advance tuition payment by credit card. This page also provides for payment of any tuition, fees, and other charges on a student's account, WSU child care payments, payments against student loans, or prepayments and regular payments for housing and dining services. Student Payments, as well as the other Web services described below, can be found in the Student Information Center, available from the menu at www.wsu.edu/wsuinfonet.

Admission Status:

In order to use the Web admission status inquiry, the applicant must first obtain a WSU Network-Id. The Network-Id, together with the person's network password, provides the "key" to access one's own information from WSU's integrated database. After the applicant is assigned a student number, by entering that student number and other identifying information, the applicant obtains his/her Network-Id and network password using the Web. The applicant can then look up the status of his/her application at any time.

Financial Aid Status:

Using his/her Network-Id and password, the applicant can also track the status of his/her application for financial aid. This allows the student to find out right away if there is missing information which is holding up processing of the financial aid application. Other financial aid Web inquiries are available after the applicant has been admitted and/or enrolled to track financial aid awards.

Address and Telephone Changes:

Applicants, as well as admitted and enrolled students, use their Network-Id and password to update their address(es) and/or telephone number(s) on file with WSU. This is also the mechanism for students to restrict release of their directory information under FERPA regulations.

Imaging and Workflow Processing for the Staff

In the spring of 1998, WSU engaged in a project to identify a university solution for document management, and, in particular, a solution for the Admissions Office to get rid of their mountains of paper. After an ambitious vendor and product evaluation effort, a selection was made in the fall. The eMedia Integrated Document Management product from Optika Imaging Systems Inc. was selected, together with a third-party document management integrator, Integra Information Technologies. Working with Integra, WSU's admission document scanning, indexing, and workflow rules were defined and programmed. Optika's newly released eMedia imaging and workflow system with the addition of Integra's scanning and indexing modules was implemented in the Admissions Office in January 1999. This implementation brought about many changes.

The first major change for Admissions is that the piles of papers are gone from everyone's desk. With the new system, application forms, checks, transcripts, and other paper documents that arrive in the mail are sorted and scanned into the system each day. As soon as a set of documents has been scanned, a staff member proceeds with indexing them. This process assigns the applicant's student number, name, campus, and other identifying information to each scanned document so that its image may be retrieved from the system in various ways. Once the scanned documents have been indexed, the images are stored in the imaging system and are immediately available for staff in the Admissions Office, or any authorized person at any location, to view. This has been a tremendous help in answering applicants' questions of whether documents have been received, etc. The person taking the call need only look up the documents in the imaging system on his/her own workstation to answer the question, rather than trying to locate that particular applicant's file in the piles of paper on any of several desks.

The second major change is in the way an application is processed. One of the reasons for the piles of paper was that all the necessary documents to process an application did not arrive at the same time. An application form was held until the application fee was paid and all required transcripts were received. With the new system, the type of each document is also captured as an index in the indexing process. Workflow rules then automatically route the application form to a holding queue until all other necessary documents have arrived and have also been indexed into the system, at which time the virtual package of documents is released for processing. Workflow rules can be set to automatically inform a staff member that an application has been held for a specified length of time, so that a letter can be sent to the applicant asking for the missing documents. At the click of a button, the letters module is launched (this is an additional feature programmed by Integra) and the staff member selects the appropriate letter. The letter text is merged with data already in the system and sent to the word processor on the staff member's workstation for review. Then, with another click, the letter is printed and is also transferred to the imaging system to be stored and viewable as part of the applicant's virtual folder.

Another case of manually holding paper documents occurred when a transcript was received ahead of time and needed to wait until the application form and check arrived. With the new system, a transcript or other document arriving before the student's application form is held in a "suspense" file until the application comes in. Transcripts or other documents held in "suspense", however, do not have any action taken on them other than to match them up to the application form when it arrives. Documents left in suspense longer than two years are purged.

Once the applicant's package is complete, workflow rules route it to the appropriate electronic queue for review and action. A staff member selects a package from the queue by using one of his/her predefined profiles. Based on package characteristics such as status, campus, or queue, profiles select and present workflow packages to staff members to be worked on. In this way, work is sorted for the individual staff member, and, when several users have the same profile, work is also spread out across the staff. Yet, behind the scenes, the packages can be in the same work queue. A staff member "locks" a package into his/her in-box before starting to work on it so that only one person is working on a package at a time.

After "locking" a completed application package, the staff member checks for complete information on the imaged application, enters specific data from or about the application into a workflow form, and checks off that the first-level review is complete. The package is then automatically "unlocked" and workflow rules route it to whatever queue is required next, perhaps for evaluation of high school course work or for entry of transfer courses into the automated transfer articulation system. The package flows into and out of various queues as determined by actions taken by staff members and workflow rules applied against data entered into the workflow system. If the applicant needs to supply additional information before an admission decision can be made, the letters module is launched. The appropriate letter is selected, data merged, reviewed, printed, and automatically transferred to the student's virtual folder in the imaging system. The workflow package is then routed to another queue to await the arrival of additional documentation. When all required information has been supplied and an admission decision is made, the staff member selects the appropriate admission or denial letter from the letters module and continues through the letters process described above.

Automated workflow processing has made a tremendous difference to the Admissions Office. Gone is the passing of student files from one staff member to the next, or copies of files from one office to the next. Each staff member can see what other staff members have done by the data entered or checked off in workflow, by reviewing package journal entries, or by looking at package history. Staff members also have the ability to make and view annotations of different types added to the images themselves. In some cases, staff members outside the Office of Admissions are involved in admission decisions. For example, the Student Advising and Learning Center (SALC) is involved in reinstatement decisions for returning students. They are now part of the automated workflow process, so that the package for an applicant that requires reinstatement is routed to a queue worked on by SALC staff at their own workstations.

Gone is the sending of paper documents from the branch campuses to the central campus for processing. One branch campus uses the fax facility in eMedia to fax application documents directly into the system. The other two branch campuses scan and index application documents for their campus into the new system from their own location. They then use the same workflow to process applications in the same way that the main campus does, with user profiles selecting only the application packages appropriate to their campus. When a package requires special processing done at the main campus (e.g., entry of transfer courses into the automated transfer articulation system), workflow processing automatically routes the package to that queue. When that work is finished, the package goes on to the next queue which can again be accessed through user profiles to see only those application packages appropriate for each campus.

Also gone (well almost gone) is the copying of transcripts and other admission documents for academic advisors and departments. Staff in other areas who need to review application documents, e.g., Athletics, International Programs, Multicultural Student Services, and the colleges, can now access the images from their own desktops rather than waiting to receive paper copies in interdepartmental mail. We expect the number of departments accessing admission documents directly from the imaging system to grow. This will result in huge time and cost savings for all concerned.

Future Enhancements

While we are extremely pleased with the Web services, imaging, and automated workflow systems that have been implemented at WSU, we also have a growing list of ideas for enhancements.

Already underway is an automated method of matching the data from an application form to existing student records to determine if the applicant already has a student number or if one needs to be assigned. From preliminary testing, we expect to match to an existing record or to create a new student number without manual intervention at least 95% of the time. For paper applications, this will ease the staff burden of looking up each individual person. For the Web applications, the match/assign software will enable an automated load into the imaging and workflow systems, along with a direct upload of applicant data into our student records system. Since we expect the number of Web applications to grow rapidly, the automated load enhancement has top priority.

In addition to Web applications, we expect to receive high volumes of transcripts electronically via EDI (Electronic Data Interchange). A second enhancement is planned to automatically load these transcripts into the imaging, workflow, and transfer articulation systems.

We plan to implement Web access to images and documents in the imaging system. This should be a straightforward matter of installing client software on a new Web server, as Optika actively supports the Web as an interface to the eMedia system. Web access will remove the need to install client software on the casual user's workstation. This will make it easier to open up use of the imaging system to the academic departments throughout WSU, to academic advisors in any location, and especially to those graduate coordinators and committees who make admission decisions for applicants to the Graduate School.

We are also considering the use of Optical Character Recognition (OCR) software to "read" information from many of the paper forms and translate that information into electronic data. Data from a scanned document could then be automatically loaded into our student information and/or transfer articulation systems. It will also be useful when the Financial Aid Office joins in using the system, because they process forms generated by WSU with barcodes containing encoded data that can be read by the OCR software.

Perhaps the most exciting enhancement is the plan to return a preliminary admission decision to the Web applicant in real-time. Although technically interesting, the real challenge here is the policy issues. If we don't already have high school records or test scores for the freshman applicant, will we accept self-reported GPA and test scores? Can we fully automate the admission processing rules to reach a reasonable decision? How can the decision be worded to the student so that it can be reversed later if necessary, or will the preliminary decision stand unless it can be shown that the applicant falsified information? As we work though these and other policy issues, it will become apparent if an automated real-time admission decision is possible.

Conclusion

Web, imaging, and automated workflow technologies have enabled a major transformation of the admissions process at WSU. From student bewilderment to easy access Web information, from uncertainty of transfer status to Web degree requirements reports, from paper application forms and checks in the mail to Web forms and credit card payments, from batch generated letters to real-time student letters, from student phone calls to Web status look-up, from piles of paper to clean desktops, from multiple paper copies to electronic images, from passing files on to the next person to electronic workflow in-boxes, from different procedures at each campus to a common electronic procedure, and from one person having a file to any number of people having simultaneous access, are all more than we thought possible just a year or two ago. With continued enhancements and exploiting other features of the technologies, we expect to realize even more improvements in the future.

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Abstract

Category: Papers Presented at EDUCAUSE annual conferences

ID Number:	EDU9921
Title:	Agricultural Pest Diagnosis Using Imaging Technologies
Author:	Brian T. Watson; Robert D. Hamilton, III; Julian Beckwith, III; Edward A. Brown
Organization:	The University of Georgia
Year:	1999
Abstract:	The Distance Diagnostics through Digital Imaging project enhances the ability of the University of Georgia Cooperative Extension Service to evaluate and propose solutions for agricultural problems, including plant diseases and pests, through the use of digital imaging and the World Wide Web. Imaging stations consisting of computers, digital cameras, microscopes and image-capture devices have been deployed in 94 county offices and in 3 diagnostic labs. To date, over 1,200 samples consisting of more than 3,600 digital images have been processed. This paper will focus on the outreach educational benefits of this technology to Georgia citizens. Aspects of the project to be covered include a description of the Georgia Extension Service and an overview of the project, initial planning, stories, lessons learned, implications to distance learning, and plans for the future.

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Agricultural Pest Diagnosis Using Imaging Technologies

Brian T. Watson; Robert D. Hamilton, III; Julian Beckwith, III; and Edward A. Brown

The University of Georgia

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ABSTRACT: The Distance Diagnostics through Digital Imaging project enhances the ability of the University of Georgia Cooperative Extension Service to evaluate and propose solutions for agricultural problems, including plant diseases and pests, through the use of digital imaging and the World Wide Web. Imaging stations consisting of computers, digital cameras, microscopes and image-capture devices have been deployed in 94 county offices and in 3 diagnostic labs. To date, over 1,200 samples consisting of more than 3,600 digital images have been processed. This paper will focus on the outreach educational benefits of this technology to Georgia citizens. Aspects of the project to be covered include a description of the Georgia Extension Service and an overview of the project, initial planning, stories, lessons learned, implications to distance learning, and plans for the future.

PROJECT OVERVIEW

Overview of Cooperative Extension

The University of Georgia (UGA), founded in 1785, is the oldest institution of higher learning in Georgia and was the first institution in this country to be chartered as a state-supported university. The UGA College of Agricultural and Environmental Sciences (CAES), originally the State College of Agricultural and Mechanic Arts, was formed in 1872 and today employs nearly 2,000 faculty and staff. The CAES is one of thirteen colleges that make up The University of Georgia, a land- and sea-grant university. The mission of the CAES is to seek, verify and apply knowledge related to agriculture and the environment, and to disseminate this knowledge through student education and public outreach programs. The Georgia Cooperative Extension Service (CES), in partnership with the United States Department of Agriculture, is the agricultural education outreach component of the CAES. The Georgia CES was established as a result of the Smith-Lever Act of 1914 and serves 159 counties - making it one of the largest extension services in the country. CES programming includes agriculture, family and consumer sciences, and 4-H and youth.

Definition of "County Delivery"

County Extension faculty members are located throughout the state to serve citizens in every county. For farmers, homeowners, plant nurseries, etc. who are in need of agricultural advice or information, these agricultural experts serve as the primary point-of-contact and the pathway through which specialized information may be obtained from CAES researchers, teaching faculty, and extension specialists.

One of many responsibilities of county professionals is the design, development, and delivery of educational programs to agricultural producers. These programs teach producers methods for maximizing crop production and improving sustainability while maintaining environmental quality. Faculty members also promote sustainable agriculture by providing up-to-date crop production recommendations through research-based, non-biased diagnostic programs. Departments within the CAES have set up a number of formal clinics and other facilities and methods for such purposes as soil sample analysis and insect, nematode, and plant disease identification. County faculty are responsible for relaying these samples to the appropriate diagnostic site as well as for communicating educational information, including the analysis and accompanying recommendations, back to the client.

Scope of the Project

Distance Diagnostics Through Digital Imaging (DDDI) is a three-year project that is funded primarily by a gift from a private foundation and by state lottery matching funds, totaling a little more than $1 million. The CAES Office of Information Technology and the Plant Pathology Department developed this project jointly to address the need for more rapid access to visual information. Such information may be used to aid in plant disease diagnosis, insect identification, or any number of other Extension applications.

The principal investigators, Mr. Robert D. Hamilton, Coordinator for the Office of Information Technology, and Dr. Edward A. Brown, Plant Pathology Extension Coordinator, championed the cause for the design, development, and implementation of this technology for several years before major funding became available. Dr. Brown began investigating digital diagnostic techniques during the early 1990s as such techniques began to gain acceptance within the medical community. Mr. Hamilton began demonstrating the power of the technology to the organization in 1994 as the necessary equipment became affordable and, therefore, accessible and feasible.

PLANNING AND IMPLEMENTATION

Problem Definition

As was noted earlier, this project arose as a response to a specific need: rapid access to visual information for agricultural evaluations. Each year, Georgia farmers submit more than 4,000 diseased or insect infested plant samples to the UGA Extension Plant Pathology Plant Disease Clinic. Historically, these samples have been either mailed or hand-delivered to the Clinic. These methods of delivery can be costly in terms of both time and/or money. The primary drawback, however, may not be quite as obvious. Approximately one-third of the samples submitted to the Clinic each year are found to be inadequate, inappropriate, or have deteriorated en route making diagnosis impossible.

Providing a Solution

To reduce sample deterioration and speed delivery and response, County Extension faculty have been provided with and trained to use microscopes with image-capture devices, digital still cameras, and the appropriate computer equipment. Faculty members use this equipment package, known as "agricultural diagnostic imaging stations," to photograph field symptoms, insects, foliage symptoms, and other identifying agents such as weeds and crop patterns. Compound microscopes and stereoscopes, fitted with cameras and image-capture devices to facilitate digital imaging, are used for close-up examination of insects, diseased plants, weeds, horticultural material, etc. This technology emphasizes proper pest and host plant sampling.

Once captured, images are uploaded via the World Wide Web (WWW). Paper forms have traditionally been mailed along with physical samples. These forms are mimicked on the DDDI web site. Such information as type of sample (commercial or homeowner), grower name and address, grower type, plant name, crop area, description of problem, chemicals applied, county of sample origin, etc. are required on these forms, along with image files, for submission of the sample. The textual data are written directly into a relational database and the image files are transferred from the client computer to the DDDI server and archived upon sample submission. The image files are automatically renamed and then associated with the accompanying textual information in the database. These sample records are also automatically tagged with time and date stamps.

Once the user has committed the sample to the DDDI system, an electronic mail (e-mail) message is automatically generated and sent to the appropriate diagnostician informing that person that there is a sample available for identification. The diagnostician is designated by the system based upon responses provided by the user in key fields of the submission form.

The diagnostician, having received e-mail notification, searches for and retrieves the sample based upon the sample number provided in the e-mail. That person then evaluates the sample and formulates a reply. In the original system, the diagnostician had the responsibility of contacting the person submitting the sample via phone, fax, e-mail, etc. to deliver the diagnosis. The newer versions of the DDDI system allow the diagnostician to record the evaluation and any accompanying recommendations into the database. Responses are automatically linked to the original submission data, and an e-mail containing the evaluation information is then generated by the system and sent to the individual who originally submitted the sample.

Equipment

Each DDDI agricultural diagnostic imaging station consists of a computer, a printer, a hand-held digital camera, a compound microscope, a dissecting microscope, a video camera, a still-frame video capture device, and a collection of plant disease diagnostic compendia. The video camera is connected to the computer via the video capture device. This camera is mated with an adapter tube that can easily be moved from one microscope to the other. This allows the user to capture digital images from either source. The hand-held camera is flexible in that it is portable, can zoom up to 10x, and will still handle macro (close-up) shots as near as 1 cm. For this project, we chose the Sony Mavica for its macro capabilities as well as its ability to save images directly to a floppy disk, greatly simplifying the process of transferring images from the camera to the computer. The complete DDDI system gives the user the ability to capture images in a visual range from 60x microscopic up to 10x telescopic.

The Backend System

The DDDI system was developed on and runs under Microsoft Windows NT Server 4.0. and its WWW services are provided by Microsoft's Internet Information Server 4.0. Originally, the system was designed around the Corel Paradox database engine. This product was chosen due to the availability of experienced development personnel and because of its wide usage within CAES. Newer versions of DDDI are being developed using Microsoft Access. This move has given programmers visual development tools that were not available with Paradox. Also, Access allows multiple users concurrent access to data, and its databases are scalable. It is anticipated that the

Access database will be upsized to the Microsoft SQL Server engine. This will give DDDI an "enterprise" level system capable of handling data stores in the multiple terabyte range.

DDDI web-to-database connectivity is accomplished through the use of Allaire's ColdFusion Server 4.0. This product allows programmers to use the ColdFusion Markup Language (CFML) that closely resembles the commonly used HTML. This language allows programmers to write code to communicate data exchanges to and from a database and will even allow the manipulation of data already stored inside of a database. HTML and CFML can be integrated seamlessly onto one web page essentially increasing the final potential functionality of such a page.

Distribution and Training

The DDDI imaging stations were distributed to all 94 sites over a period of two years. This process was well planned and carefully executed. The stations were distributed in groups of five or six at a time, and training took place at the time of distribution. Since the stations were to be placed strategically around the state, each county that would receive the equipment was clustered with one or more surrounding counties that would not. Faculty representatives from every county extension office in the state participated in the training. Those faculty members not receiving an imaging station were trained alongside the representative that would take home the equipment for their respective cluster.

The training for each group took place over two days. On the morning of the first day, faculty members were greeted with a mound of boxes. That first morning was dedicated to guiding the group through unpacking, arranging, and connecting all of the equipment. The afternoon was dedicated to familiarizing the group with the different ways by which digital images can be captured using the system.

The second day's training was geared toward teaching participants the proper methods for preparing samples. Techniques for capturing appropriate diagnostic characteristics were also discussed and demonstrated. The second afternoon involved the actual submission of test samples to the system. The group was then guided through dismantling the equipment and packaging it for safe transport to the county.

Again, this process was painstakingly planned and executed. It was important that everyone involved receive the same level and quality of training. Even those faculty members who would not have the opportunity to take an imaging system home to their respective counties need to be intimately familiar with the system's functionality. Diagnostic time can still be reduced when these individuals travel to an adjacent county to use a DDDI imaging station rather than submitting their samples using traditional methods.

As a result of additional funding from CAES, all county extension offices in the state received hand-held digital cameras. Images from these cameras can be submitted along with textual information through any Extension computer having WWW access, even if no imaging station is available in the county.

IMPACTS

Increase in County Faculty Effectiveness

We believe that DDDI serves as a cognitive tool to promote the ongoing and continuous education of our county faculty. While these faculty members are recognized as being highly trained and educated, and are considered to be "the local agricultural expert", the importance of continuing professional growth is imperative to their success in supporting agricultural activities of the citizens of Georgia.

The body of knowledge pertaining to current agricultural markets, commodities, techniques, etc. is gigantic in size and continues to grow at a staggering rate. Georgia alone has three major and numerous smaller agricultural experiment stations scattered across the state. These facilities are conducting pure research and are staffed with scientists bent on adding to the existing knowledge base.

While county faculty members have received specific training in their respective fields and do participate in continuing education programs, it is impossible for them to be well informed across the whole gamut of agricultural disciplines. In essence, it would be highly unlikely to find someone who could answer many questions relating to forestry, entomology, plant pathology, agricultural economics, horticulture, and animal science.

It is anticipated that county faculty will reap intangible benefits as a byproduct of DDDI activities. In order to properly prepare samples for imaging, one will have to consider the diagnostic characteristics of the subject. For example, if an individual were preparing an insect specimen for diagnosis, that person must consider which features of the insect must be captured in an image to facilitate an accurate diagnosis. For identifying an insect, a diagnostician often must see a close-up shot of the mouthparts, the wing configuration, the body segmentation, etc. It is expected that through experience gained in preparing and submitting these samples and then communicating with the diagnostician and the client as to the diagnosis and treatment alternatives, county faculty will further develop their own diagnostic capabilities within other areas.

In addition, the positive reinforcement from clientele will encourage learning at the "teachable moment." In one instance, a county faculty member submitted a squash sample just weeks after receiving an imaging station. The sample was diagnosed within an hour of submission and a recommendation was immediately made. The timeliness of the recommendation saved an estimated 25% of the crop which would have been lost had the traditional sample delivery method been employed. This gave the faculty member an opportunity to make a substantive difference heretofore not possible—and a lesson not soon forgotten.

Potential to Contain Outbreaks

As county faculty members submit samples via DDDI, receive feedback and develop their own diagnostic skills, it is possible that the cyclical occurrences of pests, diseases, weeds, etc. may become evident. If these individuals could recognize (or even predict) and then respond to such trends, the environmental impacts and crop loss that are often associated with insect and disease outbreaks could potentially be held to a minimum. This is the high end of the predictive spectrum.

From an immediate standpoint, there are situations that, if addressed quickly, can be controlled to great advantage. For instance, if a pathogen that could cause an epidemic is identified early, DDDI provides the means by which professionals can be notified quickly as to potential problems. This could result in solving small problems that could become much bigger if not treated immediately. Such solutions result in fewer crop losses, less pesticide application, and much lighter environmental impact.

Uses for Equipment beyond Diagnostics

While the equipment that has been put in place with project funds was distributed with the understanding that diagnostic activities should always take precedence, county personnel were encouraged to use these new resources in other innovative ways. Many users have since embraced the technology and are using the equipment to augment and expand their activities in multiple program areas.

Effect on Diagnostic Processes

One lesson learned is that Distance Diagnostics is only one of many tools available for diagnosis. It is only as effective as the completeness of the information contained in the images and textual data. There are a number of circumstances where the diagnostician must ask for additional images and information. Occasionally physical samples must be requested in order to isolate biological processes beyond the capability of county faculty. In all cases, diagnosticians must make judgments based on their expertise and request additional information where appropriate.

THE FUTURE

Implications of New Technologies

New technologies and improvements to existing technologies are constantly changing the way we view DDDI. With the proliferation of mobile computing hardware and personal communications devices, for example, the possible development of portable imaging systems is becoming more realistic. These changes are not just taking place in the computing arena. Small, portable microscopes are now available that support digital photomicrography and are still capable of providing the same levels of magnification as their bench-top counterparts.

Project Expansion

At this time, DDDI project members are investigating several opportunities for expansion of the project. Success of the core system has prompted numerous inquiries from other universities interested in developing similar systems. As a result, we have partnered with both Louisiana State University and the University of Illinois at Urbana-Champaign in designing and developing DDDI systems to enhance their respective diagnostic services. While working with these other institutions, in designing systems to meet the needs of their respective clientele, components are being developed that can be used in all DDDI systems to enhance the educational value of the information collected. Interest has also been expressed by other public-sector agencies and even some private-sector entities. Plans and proposals are being developed for addressing these needs. Additionally, International interest has generated requests for information and support worldwide.

As the DDDI system matures, we see more and more opportunities to enhance the usability and functionality of the system. When the system was first developed, it served its purpose well. Now, we are constructing features that will allow a diagnostician to forward samples to someone else for consultation or for initial diagnosis in a case where the primary diagnostician is unavailable for a timely diagnosis. We are also working towards providing both county faculty and diagnosticians with report generation capabilities as well. There are now security features in place to protect client information and we want to provide online resources for reference and research.

There are still many more functions and applications that can be built into and onto DDDI to further support the diagnostic efforts of our faculty. Among these, we are building a WWW-based library system that will allow images to be categorized and supplemented with descriptive text. This library will be available to the public and will eventually (when fully implemented) serve as a fully searchable visual diagnostic reference.

Conclusion

To date the Distance Diagnostics Through Digital Imaging System has exceeded expectations. There is abundant documented evidence of instances where DDDI has facilitated timely diagnosis or identification and intervention, preventing what could have potentially been individually (within a particular field) catastrophic crop or personal losses. The enthusiasm that has been demonstrated by county faculty using the system, as well as interest that has been expressed by other organizations in the system, has been unexpectedly great. Use of system components for public educational programs and presentations; for facilitating documentation of agricultural crop, herd or commodity quality; for identification of toxic plants consumed by livestock and humans; and for publicizing youth-program accomplishments have been visionary efforts made by county faculty. As system use expands and familiarity increases, ever more utility seems to become evident.

So far as payback is concerned, during initial implementation and since complete implementation of the system in July of 1999, greater savings from crop loss reduction has been documented than the total cost of implementing the system. However these cost savings do not include savings in cost of pesticide application and any necessary environmental remediation, nor savings from use of system equipment for immediate evaluation and recommendation, with no image/text submission by county faculty. Nor does it include the benefit of increased knowledge acquired by county faculty during evaluation of samples provided for DDDI analysis.

Additional system accomplishments and successes are yet to be seen. Continual growth of the system and its capabilities is occurring. Additional components are being developed internally and funding is stabilizing for a complete Internet Imaging System, of which DDDI is the main component.

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Abstract

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ID Number:	EDU9952
Title:	Assessing the Impact on Students of Online Materials in University Courses
Author:	Joanne M. Nicoll, Nicholas C. Laudato
Organization:	University of Pittsburgh
Year:	1999
Abstract:	Many universities currently encourage the use of online materials to enhance on-campus courses. Assessment of the impact of these technology-enhanced course initiatives is necessary if we are to gain insight into the best practices_those that faculty should be encouraged to use based on student need. Assessment studies of this type will enrich the literature of distributed learning in higher education. This paper will present and discuss 1) a process for designing assessment strategies to measure the impact of online course materials on students and 2) the results of formative and summative evaluation, including the categories of benefits reported by students. Based on a campus-wide initiative to train university faculty to use course management software, this assessment includes data collected during a pilot-term with over 1850 students enrolled in 20 courses (22 sections).

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Assessing the Impact on Students of Online Materials in University Courses

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Fall, 1999

Many universities currently encourage the use of online materials to enhance on-campus courses. Assessment of the impact of these technology-enhanced course initiatives is necessary if we are to gain insight into the best practices—those that faculty should be encouraged to use based on student need. Assessment studies of this type will enrich the literature of distributed learning in higher education. This paper will present and discuss 1) a process for designing assessment strategies to measure the impact of online course materials on students and 2) the results of formative and summative evaluation, including the categories of benefits reported by students. Based on a campus-wide initiative to train university faculty to use course management software, this assessment includes data collected during a pilot-term with over 1850 students enrolled in 20 courses (22 sections).

Introduction

In the Fall Term 1998, the University of Pittsburgh conducted a pilot project to study the instructional impact and support needs for a Web-based instructional management system. The system centered on the *CourseInfo* software package acquired from Blackboard, Inc. The pilot was the result of a nine-month campus-wide software selection process, and a four-month effort to design and develop training and support systems.

This paper describes the project, explains the assessment strategies designed for the pilot, and summarizes the results of formative and summative evaluation measures. The assessment includes data collected from students and faculty members in 20 courses (22 sections) with 1,850 student seats.

Background

The University of Pittsburgh is a state-related public research university and a member of the Association of American Universities (AAU). Founded in 1787, Pitt offers graduate, undergraduate, professional, and continuing education programs through 19 schools and four regional campuses. The University typically serves about 28,000 FTE in the fall term, and employs nearly 4,000 full- and part-time faculty members. Pitt's regional campuses are located between 30 and 170 miles from the main campus in Oakland, Pittsburgh's cultural and medical center. Among the notable sites on the Oakland campus is the 42-story Cathedral of Learning with its 28 nationality classrooms, each representing the heritage of one of the region's many ethnic groups.

The Center for Instructional Development & Distance Education (CIDDE) works directly with schools, departments, and individual faculty members to facilitate the academic goals of the

University in the areas of instructional development and technology, media support, faculty development, and distance education. With this broad mission of instructional development and support, CIDDE pursues new initiatives that will optimally support the academic priorities of the institution. These initiatives fall into three general categories: the acquisition or development of tools and facilities, the development and delivery of instructional support services, and the provision of assistance in the development of academic programs and instructional materials.

During the summer of 1997, the Director of CIDDE met with 20 deans to identify their instructional technology and distance education needs and priorities. Based on these discussions she identified three common needs: (1) for computer-based conferencing, (2) for a method to easily create online materials, and (3) for a consistent "look and feel" to the University's online course offerings.

Based on this identified need, a CIDDE instructional designer organized and chaired a committee to evaluate emerging software tools designed to facilitate the development and use of the World Wide Web for instruction. The committee included faculty and staff from CIDDE, the centralized computing services groups, and the University Library System, who volunteered to review existing software, and to try out selected packages to evaluate their potential utility. The committee articulated detailed requirements for a Web-based instructional package, identified the packages that addressed those needs, and ranked and rated each of the packages. The most promising five packages were selected for detailed evaluation, and trial copies were either accessed online or obtained, installed and tested by faculty in actual classes for the Spring Term 1998.

In May 1999, after nine months deliberation, the committee recommended that the University acquire the *CourseInfo* instructional management system. The recommendation was presented, approved, and funded through the Software and Networked Information Working Group of the Executive Committee for Academic Computing. The work of the Web evaluation committee is summarized in a web page at URL http://www.pitt.edu/~washburn/css.html.

CourseInfo is an integrated software suite that enables faculty members to develop, manage, and use Web pages for instruction. *CourseInfo* acts as a "container" for organizing the instructional components of an online course. It offers tools to administer, grade, and record quizzes, to conduct synchronous chat sessions, and to hold asynchronous threaded discussion groups. It also provides user-friendly software to facilitate the instructor's efforts to create new Web pages or incorporate existing pages, send e-mail, transfer files to and from students, and manage an online grade book. *CourseInfo* runs in both the Unix and NT Web server environments and is accessible using standard Web browsers and plug-ins.

The primary factors driving the selection of *CourseInfo* included its ease of use and its adherence to standards such as SQL and the emerging Instructional Management System metadata model (the EDUCAUSE IMS Project). *CourseInfo* was the only package previewed that enabled inexperience faculty members to create effective materials with no knowledge of HTML, yet still allow more advanced users to leverage their knowledge of HTML and Web-based authoring tools to produce sophisticated results.

Implementation of the Pilot

Project implementation was a cooperative effort between CIDDE and the centralized computer service units (the Computer Services and System Development unit and the Network Services unit), coordinated through a series of regular planning meetings and advised by several faculty committees. This section explains some of the important factors in the project implementation plan.

The University acquired multiple licenses of the *CourseInfo* package and implemented three servers in order to create a stable, secure and efficient environment. First, CIDDE implemented a test version of *CourseInfo* under Apache on a low-end Pentium processor running Linux. The test version was used to experiment with new releases and patches of the software. A second "development" server was implemented on a small Sun processor running Solaris and Apache. Faculty members used this server to develop their Web pages in a secure, confidential environment. The centralized Network Services group managed the third server, a high-end Sun processor also running Solaris and Apache. This "production" server was maintained seven days a week, 24 hours per day, and supported the online courses, faculty, and students.

In response to concerns raised by several faculty committees about the sufficiency of remote access to the Pitt network, the Network Services group increased the dial-in modem pool by 40% to over 800 dial-in ports. In addition, to handle the anticipated increase in student and faculty problems that might occur when implementing Web-based instruction, the Computer Services and Systems Development group expanded the existing single-shift help desk to a 7 ´ 24 environment. The group also took proactive steps to prevent problems by ensuring that all requisite plug-ins were available in the public student computing labs and providing in-class orientations to students at the beginning of the term.

Another potential issue was the anticipated increased desire by instructors to use computer projection technology in the classroom to demonstrate components of *CourseInfo* to their students. In response to this issue, the Classroom Management Team escalated the rate of classroom renovations to install computer projection devices in more classrooms. CIDDE's Instructional Media Services area also increased their inventory of portable microcomputers and projection units for mobile classroom presentations, and hired and trained additional student AV operators.

To increase the likelihood of the project's success, administrators in the Provost's office gave two important directives. First, they made a strong commitment to training faculty in the use of *CourseInfo*, and second, they limited the number of courses that would be offered in the pilot term. For the Fall Term 1998 (99-1) pilot, 20 faculty members developed 20 courses (22 different course sections) serving 1850 students. The goals of the pilot were to evaluate *CourseInfo* and to determine the access and support needs of implementing Web-enhanced instruction.

Summer Instructional Development Institute

Training for the pilot term was supported under the auspices of a newly proposed Summer Instructional Development Institute (SIDI). SIDI was initially conceived to provide intensive training and development opportunities for faculty over the summer. For its inaugural season, the Institute focused on training two groups of 12 faculty members in the use of *CourseInfo*. The first group was selected by the chairpersons of five science departments identified by the dean of the College of Arts and Sciences. This selection specifically targeted instructors of large, predominately freshmen courses with a goal of evaluating the effectiveness of Web-based course components in improving the experiences of students in large lecture settings (greater than 100 students per class). The second group was selected by the deans of schools and campuses that had expressed strong interest in the project. The faculty members involved were from the Faculty of Arts and Sciences (the Biology, Chemistry, Psychology, Geology, and Physics departments), the School of Education, the School of Nursing, the School of Pharmacy, the School of Health and Rehabilitative Sciences, and from the Johnstown and Bradford regional campuses.

The Institute covered basic course design topics and featured hands-on instruction related to the mechanics of using *CourseInfo* and other related software tools. The courses were designed and taught in collaboration with the centralized computing services and library groups.

After analyzing *CourseInfo* and its anticipated training needs, several key decisions were made. First, training for *CourseInfo* would be implemented using *CourseInfo*. That is, faculty members would be enrolled in a *CourseInfo* "meta course" that would (1) serve as an exemplar of desired *CourseInfo* organizational structure and concepts, (2) serve as a repository of training and reference material, and (3) provide faculty with the opportunity to gain experience with *CourseInfo* from the students' perspective.

The second decision was to focus *CourseInfo* training more on the instructional design requirements of creating a Web course than on the mechanics of using the software package. Training would therefore promote the use of a straightforward instructional design model, originally developed at Pitt's Learning Research and Development Center and later tailored to meet the needs of the University's paper-based distance education program. This approach was possible because of the relatively easy task of training instructors in the use of *CourseInfo*, due to its friendly user interface.

The final decision was to provide faculty course developers with a recommended structure in the form of a "template" course. In this approach, *CourseInfo* is viewed as a "container" of instructional materials. These materials are contained in documents and folders under appropriate subdivisions within a *CourseInfo* course site. Native *CourseInfo* ("out of the box") gives instructors a blank slate to contain any type of document in any structure or order. CIDDE instructional designers developed the "Pitt *CourseInfo* Template" to provide a more-specific structure to *CourseInfo* courses. This structure is intended to provide consistency across different courses, allowing students familiar with one *CourseInfo* section to easily adapt to a second.

The Pitt *CourseInfo* Template specifies and explains a suggested structure for the "Course Information" and "Course Documents" components of *CourseInfo*. The Course Information component is considered analogous to a course syllabus and defined to include the following sections (documents):

- Introduction
- Class Meeting Times
- Course Description
- Course Rationale
- Course Goals
- Course Outline
- Course Materials
- Course Requirements and Grading
- Course Policies
- Course Schedule

Whereas the Course Information component of *CourseInfo* contains information about the course, the Course Documents component contains the course materials themselves. The template suggests that the course materials be subdivided into manageable units of work. These units, or modules, could be associated with chapters of a text, weeks of the term, or concepts of the course. Each module would be implemented via a separate folder within the Course Document component of *CourseInfo*. Each folder is defined to include the following documents:

- Introduction
- Learning Objectives
- Lecture Notes
- Handouts
- Exercises
- Quizzes or Sample Tests
- Related Readings

The student would complete the course by working through each module in turn until all modules where mastered.

CourseInfo training was designed around the process of implementing a Web-based course using the Pitt *CourseInfo* Template. For the Summer Institute, a five-day modular training program was developed that covered this process and addressed other related tools and issues. This five-day sequence was later divided into more discreet components. A one-day core course was a prerequisite for participation in *CourseInfo*. The core course, titled "Course Design And Development Using *CourseInfo*," addressed the following topics:

- Introduction
    - Basic Web concepts
    - *CourseInfo* from the student's perspective
- Instructional Design Model and Process
- *CourseInfo* Development
    - Content editors
    - Administration and course management
    - Testing and grade book functions

In addition to the required core training, several supplemental training modules were developed and offered to faculty. Participation in these modules was optional, base on each faculty member's goals and interests. The supplemental modules included:

- Microsoft Word and Virus Prevention Using *CourseInfo*
- Microsoft PowerPoint with *CourseInfo*
- Designing and Acquiring Images for *CourseInfo*
- Using Audio and Video with *CourseInfo*
- Copyright and Legal Issues

Upon the completion of the Summer Institute, the pilot program was launched in the Fall Term 1998. Data from subsequent terms reflect significant growth in the faculty's adoption of *CourseInfo* (See Table 1, page *).

Formative Evaluation

Evaluation of the pilot program was a crucial component of the project plan. To create an evaluation strategy, two instructional designers and a research design consultant formed a project assessment team. The team designed assessment goals and strategies based on the need to gain feedback from both students and faculty on issues related to access, support, and the instructional value of using *CourseInfo*. The evaluation team reviewed *The Flashlight Project's* student inventory items as a basis of reference, drawing upon this pool of questions to develop an instrument to meet specific evaluation goals.

Because the primary goal of formative evaluation was to identify any serious problems that students might encounter with accessing and using *CourseInfo*, early intervention was important. Therefore, in mid-October, CIDDE staff visited a representative sample of nine of the 22 course sections using *CourseInfo* and administered one-page paper surveys to all of the students attending class. Of the nine courses included in this evaluation, several were high enrollment, introductory science courses (the focus of the first Summer Institute). The sample also included undergraduate and graduate courses, low enrollment courses, and those offered on the Pitt's main campus and regional campuses. Out of the 1850 students using *CourseInfo* during the pilot term, 485 students were surveyed for the formative evaluation.

These data indicated that most students (92%) had already accessed the *CourseInfo* pages for their courses (by the sixth week of the term), and that more than half of them (59%) had not previously used a Web-based tool. The students indicated that the initial in-class explanations they received from the University computer support area or from their instructor on how to use *CourseInfo* were adequate (95%). Suggestions for improvements included providing handouts and conducting the training sessions in computer labs. Students reported very few difficulties using *CourseInfo* (87% of students surveyed did not contact the 24-hour help desk with questions/problems), and those who did have difficulty were able to obtain the needed assistance. Data from the help desk indicated that most student questions focused on how to configure their personal computers for dial-in access or how to establish computing accounts.

One of the ten questions in the formative survey addressed the instructional value of *CourseInfo*, resulting in 69% of the students reporting that *CourseInfo* materials had helped their learning to a moderate or high degree. Additional positive student comments as to what *CourseInfo* components were helpful included "Lecture notes available online," "Checking my grades," "Assignments available online," and "Taking quizzes and practice exams." Only 4% of the students identified problems or concerns about using *CourseInfo*, specifying problems such as "access from home using a modem" and insufficient "computer lab hours."

Summative Evaluation

One of the main goals of this initiative was using instructional technology to enhance teaching and learning. Consequently, the summative evaluation focused on the instructional value of *CourseInfo*. The primary evaluation objective was to identify which components were helpful to students' learning and why.

Evaluation measures used during the pilot program included surveys, anecdotal data, help desk reports, and Web server statistics. Similar to the formative evaluation procedures, staff administered paper surveys to students in classrooms during the last two weeks of the term. Of the 1850 students enrolled in these courses, 796 surveys were returned.

The data indicated that students were accessing their course Web pages primarily through University student labs (436 responses), residence halls (125 responses), and via modem (263 responses). See Table 2, page _*_ for Web server access statistics.

Components Identified as Helpful by Students and Why

Students were asked to identify which components were helpful (of those used in their courses) and why. A content analysis of students' open-ended responses was completed, and the following summarizes these data. It should be noted that not all *CourseInfo* components were used in every course. For example, some courses did not use group work tools at all. The number of students' open-ended comments for each item is reported in Table 3 through Table 9.

Three of the most highly used components were also the ones that students rated as most helpful: Lecture Notes, Quizzes/Practice Exams, and Course Announcements (see Table 3, Page *). Other components rated as helpful included: Assignments, External Links, and E-mail. Student responses were very low for the remaining components (Group Work, Students Drop Box, Online Discussions, Surveys and Online Chats), probably because instructors used them only minimally during the pilot term.

Lecture Notes in *CourseInfo* took a variety of forms, including basic lecture outlines, detailed instructor notes, and PowerPoint slides. Students listed these as a major asset to their learning. The majority of students responding to this question indicated that notes enabled them to better organize information before class, allowing them to spend more time listening to the lecture. Students also reported that the notes helped them clarify and organize the information they received in class. Many students reported using the lecture notes for study and review of class information and preparing for exams (See Table 4, page _*_).

As expected, students felt that Quizzes and Practice Exams helped them to prepare for their in-class supervised exams and focus their study efforts (see Table 5 page _*_). Although these responses may reflect the availability of quizzes and practice exams, per se, and not the accessibility of them through *CourseInfo*, the features of immediate scoring and feedback through *CourseInfo* were clearly valuable to students.

Predictably, students commented that Course Announcements were helpful for keeping them informed of course-related events, such as assignment due dates, information about up-coming tests, and any changes in the course procedures. Course Announcements was the most highly used component in *CourseInfo* (reported by faculty as used "extensively"), perhaps due to the ease of application by course instructors. Also, students unable to attend classes noted that Course Announcements helped them to keep informed (see Table 6, page _*_).

Students responded positively concerning the ease of access to assignments through *CourseInfo* (see Table 7 page *). The instructional value of the practice gained from these assignments rated high as well, with students commenting that they had a better understanding of what was happening in class by completing these assignments. As with Quizzes and Practice Exams, it should be noted that the students' responses could be addressing the assignments, and not necessarily the added value of accessing them online. Many students explicitly commented on the usefulness of having these assignments online, however, as this procedure helped them to stay informed of due dates and follow a schedule for preparing and submitting assignments.

Nearly two-thirds of the students commented on the ease of access that *CourseInfo* provided to additional and helpful information through External Links (see Table 8, page _*_). About one-third of students responding to this question specifically described that these links were helpful in completing homework and assignments.

Students were positive in their responses about e-mail communication (see Table 9 page *). Over two-thirds of the students responded that e-mail through *CourseInfo* enabled them to communicate more easily with their instructors--asking questions and conversing about the course. Almost 20% commented that the ease of communication through e-mail was helpful, while others reported that it helped in contacting other students and to keep informed.

During the pilot term, instructors did not significantly use the Online Discussion, Group Work, Surveys, or Online Chat components of *CourseInfo*. Several instructors reported using these components only "minimally" and, therefore, these data will not be reported.

Comparison of Courses

Students were asked to compare the course they were currently taking, using *CourseInfo*, with other courses not using *CourseInfo*. In this comparison, students responded (either agreeing or disagreeing) that with *CourseInfo* they were more likely to perform 13 different instructionally-related activities. Of those students for whom these questions were applicable, Table 10 presents these data. The degree to which students reported using these activities varied from the highest rating of over 87% ("refer to course syllabus material") to a low of 58% ("work on assignments with other students.")

The two highest ratings were related to the access of online materials. Over 87% responded that they were more likely to "refer to course syllabus material," and 85% agreed that they were more likely to "access other online materials related to the content of this course" when compared with other courses not using *CourseInfo*. The next highest ratings related more to instructional activities and indicated that with *CourseInfo*, students were more likely to "review lecture notes to gain clarification," (85%), "complete assignments on time" (nearly 81%), "seek clarification when I did not understand something" (77%), and "actively participate in the course" (76%).

Other preferred activities included receiving feedback on quizzes and exams quickly, communicating with the instructor, spending more time studying for the course, discussing ideas from this course with other students, discussing ideas from this course with the instructor, and working on assignments with other students

Finally, students were also asked to agree or disagree with several statements as to the impact that certain online enhancements had on their learning. The highest positive response rate was to having *CourseInfo* used in other courses with over 90% agreeing. Almost 86% of the students agreed that online quizzes were helpful to their learning, and 81% agreed that the online environment contributed to their learning in the course (see Table 11, page *).

Lessons Learned

This section summarizes some of the lessons learned from the evaluations and experiences gained during the pilot and subsequent terms. The lessons are gleaned from an analysis of the formal formative and summative evaluation measures, Web server statistics, help desk reports, and anecdotal data collected from students, faculty, and support staff.

First, using online enhancements increased the time that students were involved in learning tasks, such as accessing other online materials related to the content of the course, reviewing lecture notes to gain clarification, and completing assignments on time. Time on-task is one factor that has been found to contribute to increased student learning. Both students and faculty also valued the ability to use quizzes and practice exams, with immediate scoring and feedback. This was especially important in high enrollment courses where logistics and scoring time can be barriers to their use.

Students reported that they liked online materials and that the online environment contributed to their learning. Students clearly want these enhancements in their courses. Providing outlines of lecture notes prior to a class allows students to organize information before class and spend more time listening in class. Students reported that procedures as simple as providing lecture outlines have a major positive impact on their learning. It should be noted that few faculty reported any decrease in attendance as a result of using *CourseInfo*.

During this pilot term, most instructors used more content-delivery components of *CourseInfo* (e.g., Course Announcements, Lecture Notes, and Course Assignments) than the interactive components (e.g., online discussions, chats, and group work), possibly because the former required less additional instructional design and development effort. However, as observed during terms subsequent to the pilot, faculty tend to develop online enhancements to their courses in stages, beginning with providing course materials online, then developing more interactive components, such as discussion and online quizzes. It is important to assist faculty to recognize the value of increasing the use of interactive components. As faculty become more familiar with these benefits, they may be more likely to design them into their courses. A recommendation for further study is to identify what changes, if any, are occurring with in-class teaching when online components are used.

On the basis of the pilot and subsequent terms, the key ingredients of the success of the project include the ability to engage faculty, provide training and support, and plan and coordinate the project activities.

Engage Faculty

- Advice and consent: Involving faculty in the selection process for course management software is crucial. Moreover, collaborating on a campus-wide basis (Provost, Deans, Department Chairs, and support units) is an effective model. Few individual academic units have sufficient instructional and technical resources to effectively address all the needs and support for a project of this scope. The pilot program should be part of a broad-based strategic effort.

- Motivated faculty: It is important to include motivated faculty in this type of pilot project. Those who are interested in using online materials will be more likely to create richer and more effective online materials, assist their colleagues in developing them, and be more tolerant of technology limitations and failures. Generally, they will become better role models for other faculty. For this reason, it is also important to seek and engage faculty influence leaders beginning in the early days of the project.

Provide Training and Support

- Require training: To use it effectively, faculty members need to learn the capabilities and idiosyncrasies of course management software. Faculty training should address course design concepts and introduce faculty to the software package and its local operational and support procedures. Requiring training will place less stress on support services in the future. At the University of Pittsburgh, a one-day core training module has been a required prerequisite for using *CourseInfo* for its four terms of use (over one year). In addition to training, on-going faculty support is critical to success, both in instructional design and in the use of technology.

- Focus on instructional design: Include and emphasize instructional design in any training program. Faculty who work through the thinking/planning process of incorporating online enhancements into their on-campus courses use the components of *CourseInfo* to their fullest. Keep the emphasis in training on the functionality and instructional purpose of the technology, using the technology as a tool and not as an end.

· Adapt support services: Analyzing, reengineering, and implementing effective faculty and student support services is a critical success factor for Web-enabled instruction. These include services such as operating a 24-hour help desk, ensuring adequate remote access, providing standard browser and plug-in software in public student labs, providing in-class student orientations to the software, and supporting in-class A/V presentations.

Plan and Coordinate

· Senior-level support: Because this project cut across multiple academic and service units, strong senior-level support was crucial to acquiring and implementing the tools and resources necessary to optimize the success of the project.

· Communicate and coordinate: Involve related academic and technical support units and their key staff in planning and coordination activities, facilitated by group work technologies such as list servers, shared Web pages, and audio and video conferencing.

· Follow-up: Plan and implement opportunities to discuss online instructional management systems among faculty who have used (and those who will be using) these tools with their courses. At Pitt, based on a recommendation from the Summer Instructional Development Institute faculty, a "Teaching with Technology Series" was successfully implemented. In the year following the pilot term, four faculty-led workshops were offered on topics such as "Creating a Web-based Lecture," "Internet-based Assignments that Work," and "Workable Online Discussions."

· Evaluate: It is important to develop formative and summative evaluation plans and procedures for this type of technology-related course initiative. Although evaluation is generally included as part of any pilot program, it is necessary to design and carry out on-going assessment procedures. Such procedures help to gain insight into the best practices that faculty should be encouraged to use based on student need.

Conclusion

In summary, the pilot and subsequent terms demonstrate that, given a well-supported tool that enables them to use the Web for on-campus course enhancement, without requiring extensive technical knowledge, faculty will respond positively by implementing the tool, as illustrated by the dramatic growth in the use of *CourseInfo* at Pitt (See Table 1).

Tables

The following table is based on an analysis of hits (Web page visits) taken from the Web server log file generated by the production server for the Fall Term, 1998.

Table 1: *CourseInfo* Growth by Term

	Fall 98	Spring 99	Summer 99	Fall 99
Sections	22	115	107	350
Seats	1,850	4,500	2,000	13,450

Table 2: Means of Access to *CourseInfo*

Location	Hits	Percentage
Residence Halls	327,861	19%
Computing Labs	543,643	31%
Regional Campuses	132,171	8%
Other Pitt	175,945	10%
Dial Up to Pitt	203,921	12%
ISP (e.g., AOL, MSN)	343,190	20%
Total	1,726,731	100%

Table 3: *CourseInfo* Components Rated as "Helpful" (796 Responses)

Component	Responses	Percentage
Lecture Notes	521	66.6%
Quizzes/Practice Exams	331	41.5%
Course Announcements	326	41.0%
Assignments	226	28.4%
External Links	212	26.6%
E-mail	180	22.6%

Table 4: Lecture Notes (475 Written Comments)

45.9%	Helped me to prepare for class—I printed notes before class and was able to listen more to the lecture; added organization to the lecture.
24.4%	Helped clarify class information—something I did not understand in class; helped me to organize my notes
15.6%	Helped with studying and reviewing for exams
14.1%	If I missed a lecture, I could get the basic information

Table 5: Quizzes/Practice Exams (310 Written Comments)

83.9%	Helped to prepare for exams and focus my studying efforts
14.5%	Practice was useful
1.6%	Useful for grade posting

Table 6: Course Announcements (268 Written Comments)

89.6%	Helped me to keep informed of course-related events
10.4%	If I was unable to attend a class, this helped me to stay informed

Table 7: Assignments (169 Written Comments)

49.7%	Ease of access to assignments
27.2%	With the practice gained from assignments, I had better understanding.
23.1%	Easily stay informed of what was due; could follow a schedule

Table 8: External Links (191 Written Comments)

63.6%	Provided easy access to external information; provided more and helpful information
33.0%	Provided help with homework and assignments
3.4%	Provided help with research

Table 9: E-mail Communication (144 Written Comments)

67.4%	Ease of contact with instructors and to ask questions
18.1%	Ease of communication
9.7%	Helped to keep informed
4.9%	Helped to contact other students

Table 10: Preference for *CourseInfo* vs. Non-*CourseInfo* Courses

Activity	Students Agreeing
Refer to course syllabus.	87.2%
Access other online materials related to the content of this course.	85.4%
Review lecture notes to gain clarification.	85.1%
Complete assignments on time.	80.8%
Actively participate in the course.	77.4%
Seek clarification when I did not understand something.	76.2%
Receive instructor comments on assignments quickly.	75.5%
Receive feedback on quizzes and exams quickly.	73.9%
Communicate with my instructor.	70.8%
Spend more time studying for the course.	67.4%
Discuss ideas from this course with other students.	62.0%
Discuss ideas from this course with the instructor.	59.8%
Work on assignments with other students.	57.7%

Note: In the above table, the Agree" and "Strongly Agree" responses were combined, the "Disagree" and "Strongly Disagree" responses were combined, and the "Not Appropriate" responses were not counted.

Table 11: Impact of Online Learning Components

Statement	Students Agreeing
I would like to have *CourseInfo* used in other courses.	90.2%
Online quizzes were helpful to my learning.	85.9%
The online environment contributed to my learning in the course.	81.4%
Online discussions encouraged me to think more about the course concepts than I usually do.	53.8%

EDUCAUSE Information Resources Library

Transforming Education Through Information Technologies

Abstract

Category: Papers Presented at EDUCAUSE annual conferences

ID Number: EDU9950

Title: Bridging the Chasm: Cooperative Development of Faculty Development Resources

Author: Randy Gains, Benjamin Hambelton, Harvey L. Hughett

Organization: Idaho State University, Boise State University, University of Idaho

Year: 1999

Abstract: The gap between early adopters of technology and the mainstream faculty population has been described as so wide as to constitute a veritable chasm. But with support agencies understaffed, how can participation rates be increased? What kinds of strategies should be utilized to reach mainstream faculty who appear to have fundamentally different interests and needs than early adopter groups? One approach is to leverage the work of several universities to train and support faculty in their use of technology. This is a summary of the EDUCAUSE '99 session that described a four-institution project aimed at collaborative development of faculty development resources. Working together, a workshop curriculum was designed, guides to effective practices were developed, best practice strategies in faculty development were examined, and new services were initiated to enable each campus to cross the chasm.

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Bridging the Chasm: Cooperative Development of Faculty Development Resources

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Introduction

The gap between early adopters of technology and the mainstream faculty population has been described as so wide as to constitute a veritable chasm. But with support agencies understaffed, how can participation rates be increased? What kinds of strategies should be utilized to reach mainstream faculty who appear to have fundamentally different interests and needs than early adopter groups?

One approach is to leverage the work of several universities to train and support faculty in their use of technology. This session will describe a four-institution project aimed at collaborative development of faculty development resources. Working together, a workshop curriculum was designed, guides to effective practices were developed, best practice strategies in faculty development were examined, and new services were initiated to enable each campus to cross the chasm. Perspectives and experiences at three of the institutions will be shared.

Summary

Idaho's four-year institutions each have faculty who have pioneered effective and innovative uses of technology in their instruction. Each institution has established goals to foster additional appropriate use of technology to increase the impact and benefit to student learning and faculty productivity. Each institution has struggled to increase the participation rate of faculty using new teaching technologies and to engage the large mainstream of faculty who have yet to explore the benefit of these technologies.

The gap between early adopters of technology and the mainstream population has been described as so wide as to constitute a veritable chasm. Current support approaches have helped the early adopters (10-15% of faculty) but only very rarely have these strategies crossed the chasm into the mainstream. This collaborative project seeks to implement new strategies to support a new generation of adopters.

Reviewing the literature related to faculty adoption of technology and our own experiences lead us to the following assumptions concerning the mainstream faculty population:

- Mainstream faculty have significantly different characteristics and interests from their early adopter colleagues.
- Mainstream faculty do not share an interest in technology and such a focus often serves as a barrier to experimentation.
- Mainstream faculty are more risk aversive in this area than early adopters.
- Mainstream faculty have less access to resources than early adopters.
- Mainstream faculty require more training and experience with technology.
- Mainstream faculty require significantly more technical support.
- Mainstream faculty require more assurance that a given technology will work, and that adequate help will be available.

We also assumed that mainstream faculty need qualitatively different strategies to foster and encourage adoption than their earlier adopter colleagues, including:

- Mainstream faculty require well proven technology applications that offer risk free value.
- Must perceive some subjective cost benefit in which the benefits of technology exceed the costs associated with learning and accessing technology
- The principle benefit for mainstream faculty must be measured in teaching outcomes; value becomes a

function of assured teaching improvement coupled with the assurance that the technology is reliable and workable.
- An important factor in deciding to adopt technology is the opportunity to communicate with other adopters.
- The most important common interest around which early adopters and mainstream faculty might communicate is their shared interest in the discipline and teaching.

In order to address these assumptions about the characteristics and strategies needed to foster technology use among mainstream faculty, the four public four-year institutions in the state sought to collaborate and share efforts towards these goals through the use of a statewide Technology Incentive Grant. The grant awarded to the Provosts of each institution provided seed money to begin to work together to attract, train and support mainstream faculty in the appropriate use of technology.

The institutions decided on the following objective and initial activities:

Collaborative Objective: Increase the participation rate among mainstream faculty in new media technology use by:

- the development of alternative support and adoption strategies
- the cooperative development and delivery of faculty training materials
- the creation of facilities designed to support mainstream faculty work and practice with new media tools
- the creation of mechanisms to connect early adopters with mainstream faculty for mentoring and advice.

The Initial Strategies included:

- Provide training which emphasizes the solution to teaching problems or achieving improved outcomes.
- Provide access to:
    - appropriate hardware and software for courseware development
    - instructional design consultation
    - adequate technical support
    - practice opportunities
- Provide a mechanism for mainstream faculty to learn from and connect with early adopter mentors.

The presentation slides and examples of cited activities can be viewed at http://itc.boisestate.edu/icet/.

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Transforming Education Through Information Technologies

Abstract

Category: Papers Presented at EDUCAUSE annual conferences

ID Number:	EDU9913
Title:	Building a Better Alternative to "Joe's $999/$899/$799 PC"
Author:	Mark Aseltine, Christopher Bradie, Donna M. Milici, Ira Winston
Organization:	University of Pennsylvania
Year:	1999
Abstract:	The Technology Distribution Redesign Project (TDRP) team was created as a short-term task force charged with outlining a strategy to develop an integrated, easy-to-use model for hardware and software acquisition that aligns with Penn's technology objectives. Jointly sponsored by the Vice Presidents of Finance and Business Services and the Vice Provost for Information Systems and Computing (ISC), the cross-functional scope of the project entailed revisiting the traditional technology procurement support roles of the campus computer store, purchasing group, and central information technology organization. The outcomes of the team's efforts thus far provide evidence that cross-divisional leadership in strategic computing initiatives ensures campus wide buy-in and can result in incremental savings and improved service offerings that align with both the University's technology objectives and overall mission. This document summarizes the TDRP team's findings and concludes with suggestions for action items related to the successful implementation of the strategy.

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Building a Better Alternative to "Joe's $999/$899/$799 PC"

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Technology Distribution Redesign Project: Abstract

The Technology Distribution Redesign Project (TDRP) team was created as a short-term task force charged with outlining a strategy to develop an integrated, easy-to-use model for hardware and software acquisition that aligns with Penn's technology objectives. Jointly sponsored by the Vice Presidents of Finance and Business Services and the Vice Provost for Information Systems and Computing (ISC), the cross-functional scope of the project entailed revisiting the traditional technology procurement support roles of the campus computer store, purchasing group, and central information technology organization.

The team agreed on two underlying principles: first, that a web-based model was essential for reducing infrastructure, providing consistency in communicating information, and delivering services to the Penn Community; second, that the success of the web interface would rest on the existence of a self-funded organization responsible for the ongoing management of the services necessary to support the model. The team's proposal suggests that the combination of the electronic interface and the managing organization will overcome the challenges that exist as a natural result of Penn's decentralized structure, fragmented internal processes, and changes in the external market.

The outcomes of the team's efforts thus far provide evidence that cross-divisional leadership in strategic computing initiatives ensures campus wide buy-in and can result in incremental savings and improved service offerings that align with both the University's technology objectives and overall mission.

This document summarizes the TDRP team's findings and concludes with suggestions for action items related to the successful implementation of the strategy.

Origins of the Process: Marketplace Challenges

In 1997 the Computer Commodities team was created to focus primarily on discount structures, ordering methods, and procurement for desktop computers. The team was led by Acquisition Services with the assistance of Purchasing Group Inc. (PGI), an outside consulting firm. The group's efforts resulted in purchasing agreements that provided pre-negotiated discounts for departmental customers and also created various web-based information mechanisms.

At the conclusion of the initial phase of the team's work, it became clear that there was a need to devote more effort to ongoing management of vendor programs and to improved communication about recommended products and preferred vendors. In addition, there was a significant amount of feedback from the campus that an effort to develop a more comprehensive strategy, including software licensing, was needed. Finally, in the external environment, there are an increasing number of new suppliers offering diverse services such as enterprise-wide site licenses, leasing programs, e-commerce, and build-to-order systems. The following are examples of the challenges impacting the Penn community:

•With computer products becoming more of a commodity, the number of suppliers, products, and available services continues to increase. As a result, there is greater difficulty for the end user in obtaining consistent and reliable product information to understand the available optionsparticularly as they relate to both their acquisition cost and their impact on support issues and Penn's technology standards. To better manage this dynamic, there is a strong need to provide a consistent message to the end user community.

•Individual departments and their local computer support providers have autonomy in their purchase decisions. The varying levels of expertise among the staff results in a broad range of support needs: there are those who are largely self-sufficient and need only to have a mechanism in place that allows them to procure goods; in contrast, there are those who rely on the University and its central support services to obtain guidance and direction; finally, there are others who require that their transactions be facilitated from pre- to post-sale support.

•Suppliers offer multiple ways of acquiring their goods and services. Multiple (and potentially conflicting) computer vendor agreements exist throughout the University. We identified examples where an identical system configuration could be obtained at different price points depending on whether an end user purchased through a VAR, the campus store, the vendor's web site, the University's central contract, or the manufacturer's sales agent. There was *no guarantee* as to which of these sources would provide the end user with the lowest cost at any given time, nor any organized process to monitor the procurement at that level to ensure an optimized solution.

Internal Needs Assessment and Organizational Analysis: Weaknesses and Opportunities

In order to develop a comprehensive solution, senior managers from across Penn's schools and administrative centers participated. Computing directors from Arts and Sciences, Engineering, Law, Medical, Dental, and Wharton schools represented the needs of their faculty, staff, and student purchasers, and helped define a strategy that was consistent with their IT acquisition and support models. From the administrative areas, directors from ISC, Business Services, Acquisition Services, and the Penn Health System examined current processes and assessed opportunities to improve services.

The team members engaged in an exercise called a SWOT Analysis (*S* trengths *W* eaknesses *O* pportunities and *T* hreats). Representatives from Acquisition Services, ISC, and the Computer Connection each presented an internal "self analysis" of their respective organizations; the remaining team members, from the schools and the health system, provided feedback and shared their perspectives. The goal was to conduct a constructive exercise that would review areas where the central support organizations excelled, those where a need for improvement existed, those where new options were available, and those where restraining forces might arise.

The team then turned its attention exclusively to the areas that were identified as weaknesses and opportunities. To remove the possibility of being constrained by organizational barriers, the data was summarized without identifying the specific support organization. This was key to the success of the exercise because it encouraged the group to take joint ownership and responsibility, rather than assign blame. With the organizational headers removed, the data was categorized into six specific areas. These are listed below, along with examples of key relevant issues:

•***Management of expertise and human resources***

- Do our staff members consistently demonstrate the ability to fully respond to end user needs?
- How can we improve our ability to negotiate creative solutions that will proactively address the technology needs of our community?
- Are there sufficient labor resources to provide the service levels we desire?

- How will we respond to the difficulties in recruiting new talent into our departments?

•Development and expansion of services offered

- Do the existing processes and systems meet the needs of the end users?
- How do we best take advantage of emerging procurement methods such as e-commerce?
- Are there ways to improve the efficiency and simplify the processes associated with the services we provide?

•Dependency on existing infrastructure

- Are we managing transactions efficiently? Are our processes still current or are there better options available?
- How do we manage risk and liability in a dynamic marketplace (inventory, obsolescence, program changes, etc.)?
- Are we constrained from exploring alternatives because of our existing investments?

•Financial resources

- How do we obtain funding for centralized computing support initiatives?
- Is it possible to keep pace with the rising costs associated with maintaining/expanding service levels?
- Can we find ways to better manage our total cost of ownership?

•Partnership opportunities

- Have we fully explored available vendor resources and options?
- Are our vendors familiar enough with our institution to appropriately respond to our needs?
- Are there unique partnership opportunities between the schools and administrative centers that remain unexplored?

•Marketing and communication

- Are we effective in defining and communicating our institutional needs to our vendors?
- Can we create an easy-to-navigate system that highlights useful information for the end user (recommended products, procurement methods, and best-pricing options, technical information, etc.)?
- How can we better provide clear, consistent information to the campus community?

From this exercise, the team learned that the challenges faced within individual units were more universal than suspected. Understanding this dynamic was a milestone in recognizing the importance of working toward a common vision.

This exercise revealed that there were constraints under the existing model that challenged Penn's ability to respond to the dynamic needs of the changing marketplace. Maintaining current service levels was increasingly difficult, and responding to the need for expanded services would require significant investment. It became clear that a new strategy was needed, and that the current organizational structures should be reconsidered in order to develop an improved solution.

Value Propositions and Co-Marketing Initiatives

Early on in the process, the team agreed that computer-related products were distinct from other types of commodities for a number of reasons, including narrow vendor margins and the inability to mandate the use of any particular product, brand or platform. As such, the ability to leverage buying power to achieve lowest-possible cost was inherently limited.

Though it was not possible for Penn to mandate the use of a particular product, the team concluded that the University's endorsement of vendor product lines had significant influence in shaping customer buying decisions. In exchange for this endorsement, Penn would require the vendors to meet certain criteria, including access to second-level technical support, special training opportunities, and provisions for revenue generating activities to fund technology related initiatives. It was agreed that the University and the vendors would pursue a value proposition that went beyond leveraging buying power, by seeking to co-market and co-support goods and services that would better align vendor objectives with the overall technology goals of the University.

In short, the goal of co-marketing is to transform vendors' standard programs and offerings into a customized solution tailored to the Penn community, while simultaneously generating a source of revenue that can be used to support centralized technology initiatives.

Benchmark Exercise: Exploring Precedent in Peer Institutions

The timeframe for benchmarking was short. Because of the relative newness of TDRP types of initiatives in the higher education channel, there were a limited number of institutions with relevant precedents. Parallel organizational structures and similar population demographics were the primary factors in identifying universities for the benchmarking process. Harvard and MIT, which engage in two very distinctive structures, were selected as the focus of exploration. To this end, TDRP team representatives from the schools and administrative centers visited both institutions and met with their senior managers responsible for procurement, retail management, and IT oversight.

The Harvard model idealizes the campus retail center as the primary outlet for technology-related procurement and related support services. The campus store, help desk/call center, on-site support service, and break/fix repair organizations work underneath the same umbrella within the central IT organization. In contrast to the Harvard model, MIT has discontinued its traditional retail procurement model in favor of a web-based, direct purchasing process, while maintaining a walk-in service center devoted solely to customer service-related functions and end user consultation.

While neither the Harvard nor MIT model was entirely appropriate for Penn, each institution provided insight into how Penn might develop its strategic direction and contained elements that would be desirable in a newly developed system. Specifically, the team determined that it was important to maintain direct control over technology support services and that a portion of the University's activities should generate funding to support those services. Based on these two principles, the team directed its efforts to develop a structure that would support the objective.

The Desirable Model for Penn: Reducing Infrastructure, Leveraging Expertise

Using the information from the SWOT analysis and the observations from the benchmarking exercise, the team considered several possible scenarios for delivering services. Topics for consideration included outsourcing the Computer Connection's management to an external agent; transitioning all distribution services to a web-based reseller; and supplementing an on-site retail store (whether University-operated or managed by an outside entity) with a web-based distribution. The team felt that none of the three scenarios adequately addressed all of the concerns identified in the SWOT analysis.

Further discussion among the team members led to several conclusions. Below are some of the highlights:

•It is desirable for Penn to reduce or eliminate infrastructure wherever possible by relying on the distribution services of vendor partners. Simultaneously, the University must retain responsibility for establishing and managing the parameters that will map vendor programs to Penn's standards. Vendor programs must be monitored and guided on a continual basis so that they work in concert and align strategically with Penn's overall technology objectives.

•An on-site customer service center is necessary to meet the requirements of the end user community and to ensure Penn maintains its influence in shaping the campus technology strategy, particularly as more vendors move toward a direct-business model. In addition, the varying degrees of customer expertise in Penn's distributed support environment necessitates that a central agency be responsible for proactively managing pre/post transactions services and communicating consistent messages to the University community. The service center should showcase demonstration equipment, provide stations for web-based ordering, and maintain an inventory of peripheral equipment and software to support walk-in sales. This organization should also be responsible for the management of vendor programs as well as their associated marketing and communications.

•Development of a seamless, easy-to-use, web-based interface is important for the effective communication of clear and consistent messages to the University community. A single point of entry where comprehensive product and pricing information (along with standards and recommendations) can be easily obtained is desirable. Although having the web system interface with the University ordering and billing process is a critical pursuit, such an endeavor should not inhibit the progress of designing an electronic repository of information in the interim.

From this discussion, the concept of creating a "virtual store" under the auspices of a newly organized customer service center emerged.

Team Recommendations: Articulating the Strategy

The recommendations below reflect the conclusions resulting from the TDRP process:

Objective: *To develop a reliable delivery mechanism that is* ***EASY TO USE***

Strategy: Develop a web-based interface that will provide end users (both administrative and faculty/staff/students) with a common point of entry for information and procurement tools. The goal is to integrate a number of independently maintained web sites into a single path for the information. In addition, the procurement component should be developed in concert with campus e-commerce initiatives.

Rationale:

•Provides a centralized source of information for product sources, offerings, discounts, and alternatives

•Offsets distribution infrastructure costs by relying more on the distribution services of the vendors

•Organizes options and prioritized solutions for customers to assist in their decision making process (i.e. helps brings a unified front to a decentralized environment)

Expected Result: Improved customer service experience and incentives for purchasing recommended products at the lowest cost, making "Joe's $999 $899 $799 PC" much less appealing

Objective: *To pursue customized programs that will be* ***VALUABLE TO THE COMMUNITY***

Strategy: Pursue co-marketing initiatives which endorse vendor programs that have been customized to align with campus standards and that will support revenue-generating activities.

Rationale:

- Tailors generic vendor programs to Penn's specific environment in order to better fulfill customer needs
- Supplements volume discount pursuits by providing sources of revenue to fund desired centralized services
- Reduces support costs by encouraging a standardized technology

Expected Result: Ability to generate sources of funding and work toward support-cost reduction

Objective: *To develop a model that will* ***SUSTAIN CENTRAL SERVICES***

Strategy: Restructure the campus computer retail center into a customer service organization responsible for the ongoing management needed to develop and sustain successful vendor programs.

Rationale:

- Minimizes infrastructure costs associated with technology distribution (box pushing, etc.), re-deploying resources to focus on value-added services
- Establishes an on-campus center to provide customers with pre/post transactional services
- Provides an agent to work with the end-user community, IT services, and centralized purchasing to ensure goal alignment and successful program implementation
- Ensures that a knowledgeable intermediary is available when intervention is required internally or with vendors

Expected Result : Improved management and allocation of University resources

Organizational Support Structure: Outline for an Integrated Model

Collaboration across the key administrative departments involved is critical to the success of the proposed model. It is essential that Penn speak with a unified institutional voice when negotiating and partnering with vendors. It is also important to provide an uncomplicated entry point for campus users, with the supporting infrastructure behind the scenes. To this end, the team developed a diagram that outlines the respective roles and responsibilities of each administrative center and also illustrates the strong connections that need to exist among the groups. (See Appendix A).

Information Systems and Computing will continue to work with the user community to set the strategic direction for campus technology by defining standards, providing strategic direction, and evaluating available technology options. Acquisition Services will continue its role in negotiating contracts that are consistent with the University's technology objectives while ensuring proper compliance with the requisite terms, conditions, and procurement-system implementation necessary for the effective implementation of the vendor programs. In concert with Acquisition Services and the University e-commerce team, the campus store will develop an e-commerce solution that will supplement the retail center. It is anticipated that over time, the ratio of walk-in sales will decrease in favor of the web-based system. The campus store is tasked with using innovative methods to encourage use of the web-based system as the preferred ordering mechanism.

The team's recommendations call for restructuring the campus computer store to eliminate as many of the non-value-add infrastructure processes as possible (e.g. maintaining large inventory and related delivery services) in favor of creating a service organization focused on managing and implementing vendor programs. The source of funding for the organization would stem from the revenue resulting from sales-related activities that it would continue to provide. In short, the newly created organization would manage the "entry point" into the integrated system.

Responsibilities of the newly organized service center are to include:

- Accountability for the effective operation of the web-based system and associated vendor-direct delivery processes
- Facilitation of pre/post sales customer transactional services
- Management of relationships with technology vendors including oversight of co-marketing agreements, software site license programs, and initiatives on behalf of schools/centers
- Operation of an onsite retail transaction center with a select inventory of peripheral hardware, software, and accessories available for purchase
- Administration of front-end user interfaces and back-end data analysis related to technology procurement to better leverage purchase decisions
- Communication with legal department and other officers charged with ensuring compliance with University's established terms and conditions
- Interaction with end user community and IT services with the goal of ensuring goal alignment and support of Penn's overall technology objectives, initiatives, and projects
- Communication with campus community to market and encourage usage of the system
- Proactive facilitation and advocacy in situations where intervention is required internally or with vendors
- Regular review and assessment of programs and services to ensure alignment with campus needs

Summary and Conclusion

In summary, the recommendation of the TDRP team is that Penn harness the power of web-based information sources and ordering tools within a single, self-funded organization charged with integrating the functions of customer services, communication and marketing of information technology standards, and computer vendor program management.

Having developed consensus from the team members, the TDRP initiative has moved into "Phase II" implementation. A subset of the team, comprised of members from the administrative centers, has been chartered to carry out the recommendations that were established in the larger group. Work with our major vendors on co-marketing agreements, development of a newly-designed organizational service center, and designs for a web-based ordering solution are targeted for implementation by July 1, 2000, the beginning of Penn's new fiscal year.

Acknowledgements

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Excecutive Sponosors:

Dr. Kathryn J. Engebretson, Vice President, Finance

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Additional thanks to:

Helen Anderson, School of Engineering & Applied Sciences, Sr. Director, Computer Ed. & Tech. Svcs.

Isobel Cashman, Schools of Arts of Science, Director, Desktop Computing

Gerard McCartney, The Wharton School, Executive Director, Computing & Information Technology

Dr. Felice Tilin, Director, Leadership Development

Marie D. Witt, Associate Vice President, Business Services

Special thanks to the following & their colleagues for sharing their expertise & experiences with us:

Joanne Hallisey, Manager, MIT Computer Connection, Massachusetts Institute Of Technology

W. Tod Hadley, Manager, Client/Vendor Services, Harvard University

Frank Urso, Director of Technology Services and Printing & Publications, Harvard University

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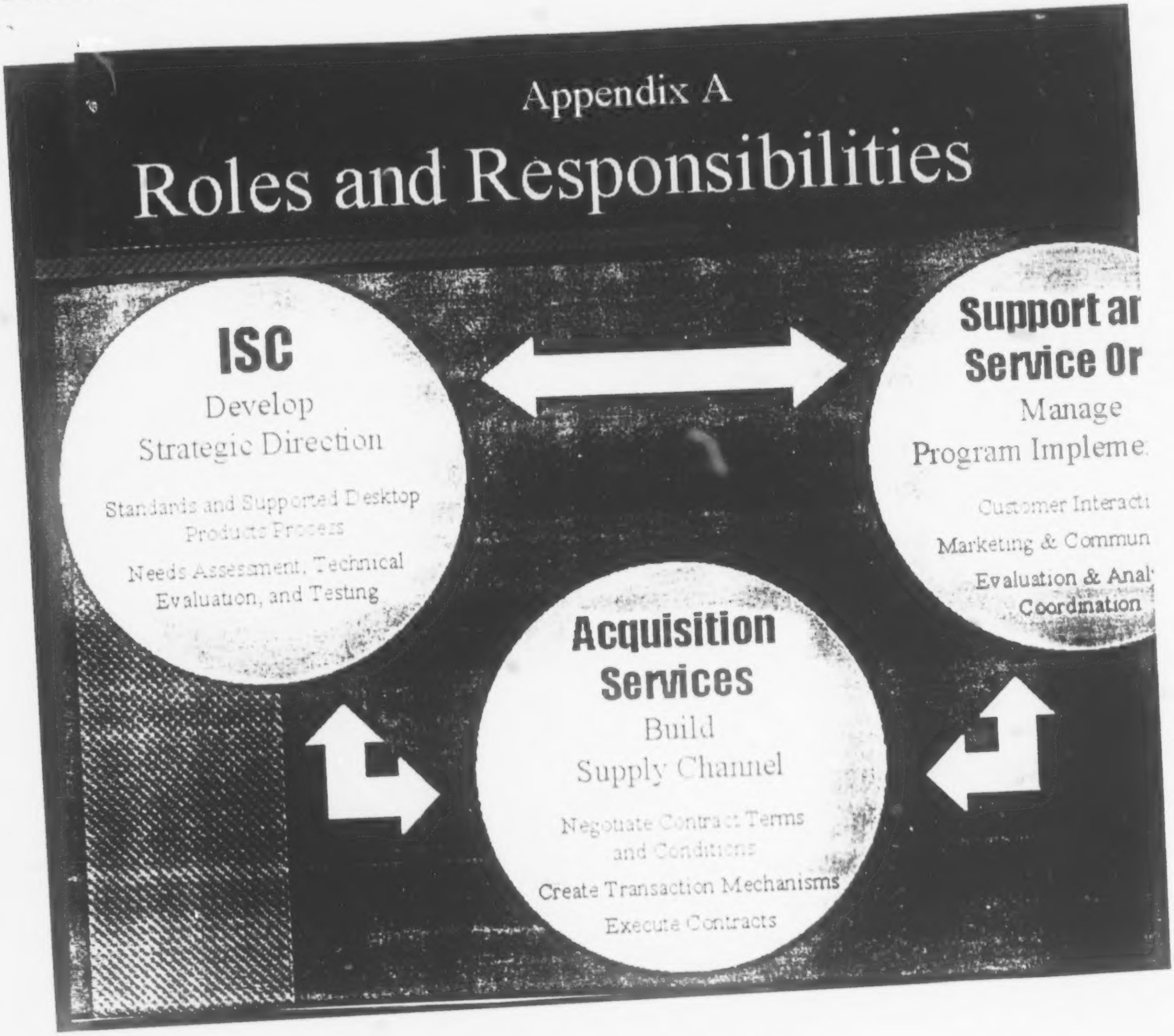
Appendix A:



Appendix A

Roles and Responsibilities

ISC

Develop
Strategic Direction

Standards and Supported Desktop Products Process

Needs Assessment, Technical Evaluation, and Testing

Support a
Service Or

Manage
Program Impleme

Customer Interact

Marketing & Commun

Evaluation & Anal
Coordination

Acquisition Services

Build
Supply Channel

Negotiate Contract Terms and Conditions

Create Transaction Mechanisms

Execute Contracts

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Abstract

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ID Number:	EDU9933
Title:	Building to Scale: An Analysis of Web-Based Services in CIC (Big Ten) Libraries
Author:	Barbara I. Dewey
Organization:	University of Iowa
Year:	1999
Abstract:	This presentation discusses "virtual" services located on the 13 CIC, Committee on Institutional Cooperation (Big Ten) member libraries' web pages. All CIC institutions are developing innovative new services to better serve their large student, faculty, and staff populations. Issues and strategies related to scaling library services with web-based delivery systems will be discussed using data from a survey of the member libraries as well as analysis of each library website. Successes and problems with the scaling and "findability" of different services (reference, instruction, electronic reserves, virtual tours, etc.) are summarized with suggestions for further web development.

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Building to Scale: An Analysis of Web-Based Services in CIC (Big Ten) Libraries

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Iowa City, Iowa

Abstract

This presentation discusses "virtual" services located on the 13 CIC, Committee on Institutional Cooperation (Big Ten) member libraries' web pages. All CIC institutions are developing innovative new services to better serve their large student, faculty, and staff populations. Issues and strategies related to scaling library services with web-based delivery systems will be discussed using data from a survey of the member libraries as well as analysis of each library website. Successes and problems with the scaling and "findability" of different services (reference, instruction, electronic reserves, virtual tours, etc.) are summarized with suggestions for further web development.

EDUCAUSE '99 -- Track 1
Friday, October 29|
8:15AM- 9:00AM

CIC Libraries – A Unique Consortia

Advancing library services in large universities requires creative approaches for "building to scale." This is certainly the case for CIC libraries whose home institutions serve thousands of students, faculty, staff, and others. Developing virtual web-based services is an increasingly viable avenue to bring library services to the users around the clock. This paper examines how the CIC libraries are using the web as a scaling tool to deliver services for the campus and beyond.

The paper builds on an initial study of CIC libraries done for the 1999 Association of College and Research Libraries Annual Conference. It is hoped that these studies may provide ideas for next generation development of the CIC individual and joint web pages that include innovative web-based collaborative services as well as seamless access to collections.

The CIC libraries' mission broadens its historical interest in collection cooperation to include services:

Through cooperation and collaboration, to advance the missions of the individual CIC libraries in their support of teaching, research, and service by:

- CREATING – individually and collectively – new ways to fulfill the information needs of the faculties, students and staffs of the CIC universities;
- EXTENDING and ENHANCING the information resources and services available on each campus by providing equal access to complementary resources throughout the CIC; AND THEREBY, IMPROVING the collections, information resources, and services of the individual CIC libraries.

While individual CIC libraries have advanced web-based service delivery at different levels a number of themes and issues are emerging. The initial CIC website study used a questionnaire to gather information about web-based services available in the winter of 1999.

This paper examines the state of service development on the websites as of fall 1999.

Where is the Library?

Actually locating the CIC libraries' homepages can be a challenge for students and faculty. As of fall 1999 five of the 13 CIC institutions (38%) feature a direct link to the library's homepage from the institutional homepage. King found better results in a study of ARL (Association for Research Libraries) web pages where only 44% of library homepages could be found in one step from the institutions' homepage. Four CIC institutions require two clicks to get to the library homepages. The user must determine what category to click in order to find the library and then click on it. The categories chosen by these four institutions include "resources & services," "services used often," "campus life" and "library and technology." In some cases the word "library" is on the homepage but it is not "clickable." Three institutions require three clicks to get to their respective libraries' homepage. Categories used include "scholars and researchers," "schools and academic departments," and "academics & research." One institution requires four clicks to get to the library's homepage even though the word "library" does appear on the institution's homepage.

Reasons for the range of visibility for each CIC library vary but probably include historical factors of institutional web creation and involvement level of library staff in institutional web creation. Discussions with CIC librarians indicate that once they become aware of the library's imbedded location they attempt to rectify the situation to provide the best possible visibility for the library's homepage. A study of the placement of additional links to the libraries' homepages within other institutional web pages would be revealing in term of multiple entry to the libraries' homepages (i.e. from institutional research page, colleges, departments, or student resources pages).

Where is the CIC?

Though this paper is not focused on library catalogs it is important to note that all 13 libraries provide access to the CIC Virtual Electronic Library otherwise know as the CIC VEL which includes the libraries' collective catalogs. However, only three list the CIC VEL off their homepage. Two other libraries provide the user with an opportunity to click on "other catalogs" or "catalogs of other libraries" where the VEL may then be found on the second click. In a 1998 study Allen and Prabha found that in libraries where the VEL is embedded it takes users an average of three clicks to locate it.

As of the fall of 1999 none of the CIC libraries link to the CIC website, itself (currently it does not contain many specific services for library users). Ironically it takes four clicks to get to the "Links to CIC Libraries" page from the CIC consortia homepage. Another possible barrier is that users cannot go to a CIC library catalog within the VEL and then move to that library's homepage.

An important effort with direct implications for advancing individual and collaborative services of the CIC libraries is Northwestern University Library's search site for CIC libraries' web pages. The site provides users with the ability to search by string or phrase, individual words or utilize Boolean logic for one or more words. Though still in development the site has potential for users to identify specific services found at multiple CIC libraries. It can also be used by CIC librarians and faculty to determine subject areas found on individual CIC library websites and to see if other libraries have developed tutorials, bibliographies, or other service tools. In the future it could be used to group services together or as a site for a jointly developed service such as computer-based tutorials.

The CIC libraries are also working on more sophisticated searching capabilities for the Virtual Electronic Library crossing remaining boundaries between online catalogs and library web pages. Currently each library has many different digital initiatives underway but these are often hidden from the user because they are imbedded in the web page or perhaps not "cataloged" in an obvious way. Roy Tennant summarizes that "determining a logical structure that supports multiple uses" is the key to developing information for different people who seek and use the information in a wide variety of ways. Thus, a combination of solid cataloging practices and good web placement is a continuing challenge and worthy goal for all of the libraries.

Services on the Web

A primary factor for delivering successful web-based services is that the closer the service site is to the homepage the more accessible it will be to library users. For example, Wan and Chung examine web page design in terms of network analysis. They classify websites according to the complexity of their designs, a factor strongly related to effectiveness and efficiency for users. After mapping the structure of websites they concluded that it is desirable to keep web pages within a close distance to the homepage. McMurdo agrees with the concept of a shallow structure for websites. A second factor in calculating usability is whether users can actually identify the service by its name or category. Naming services can be a help or a hindrance to usage. A third factor, perhaps most basic, is whether or not the user can find the service even if it is located on the homepage. Some library homepages use clickable words, some use buttons, and others a combination of both.

Staff

Library users' ability to get to appropriate staff, either by name or by function is a critical service feature of research libraries. However, an examination of the library homepages indicates that only three of the 13 libraries place a staff directory off their homepages. Also, it is quite rare for homepages to list phone numbers. Of the 13 CIC libraries only one homepage lists the library phone number and another library only lists its street address.

Scaling Library User Education

The CIC libraries are all engaged in library user education programs. Student populations number in the thousands at each institution so the challenge of scaling these program to reach more people is paramount. The CIC libraries offer many different educational programs in a variety of formats including general, subject-based, targeted, course-based, computer-based, and drop-in. Despite these massive efforts many students are still not reached. One problem is making sure students are even aware of the special programs designed to help them use the library. Marketing instructional services effectively is a huge challenge for research libraries.

To this end six CIC libraries have library instruction in some form on their homepage, six others have their education/instruction section two clicks from home, and the remaining library requires three clicks from home. When library instruction is not on the homepage users have to sometimes guess which headings it is under. Choices include "using the library," "about the library," "learn to use the library," what's new," "reference," and "library information."

CIC libraries use the web to advertise library user education courses such as Iowa's Introductory *LOTs (Library's OASIS Training Sessions) of Help!* and drop-in workshops such as *POW (Personal Oasis Workshops* or Penn State's *Electronic Seminar*. Though not part of this project it would also be interesting to look at how many individual course websites link to library web pages.

Web-Based Tutorials

Eight CIC libraries (six from their homepage) are addressing the scaling problem for library instruction, in part, with general web-based instruction, packages, or tutorials. Students can work through the electronic tutorials at their own pace and within their own schedule. Some of the tutorials, such as Iowa's *Library Explorer* and Penn State's *Training Wheels* feature short tests of knowledge for "on the spot" evaluation of learning. Others include Illinois' *Online*

- *Catalog Tutorial*, Purdue's *Research Tutorials*, Minnesota's *Research Quickstart*, and Wisconsin's *Learning Tips/Tutorials*.

A future development for CIC libraries might be to identify cooperative projects for web tutorial development perhaps using the CIC Virtual Electronic Library catalog and its effective use as an initital project. A coordinated effort could save time and resources.

Virtual Reference and Information Services

Five of the 13 libraries feature a direct link from home to e-mail reference services. Four others have the service but users must click from two to four times to locate it. Three CIC libraries call their service "Ask a Librarian." Other names include "Ask Us," "Reference Question," "LibInfo," "Virtual Reference Service," and "Email Ref Page." In all cases library users can pose a question and expect an e-mail response in a certain length of time.

Research Consultations

More in-depth consultation services are visible on at least one homepage called "Research Consultations." Students and faculty can sign up for an appointment to go over a research project or problem with a subject expert in the library.

Access Services

All of the libraries have some information about circulation of materials, renewal and fine policies, and how to obtain materials not owned by the home library.

Circulation: Six of the 13 libraries feature circulation services on their homepage and the remaining seven located circulation two to three clicks from home. Circulation services available range from information about the services to interactive forms permitting users to renew books and check the status of their accounts.

Interlibrary Loan: Three out of 13 CIC libraries have a direct link to interlibrary loan services from their homepage. Others have links requiring either two to three clicks from home to reach ILL services. Interlibrary loan is a particularly important service area for CIC libraries because of the VEL's evolving patron-initiated interlibrary loan capability. However this feature is hidden in the individual CIC library web pages and is not referred to on the ILL web pages. It will be interesting to see, when fully operational, how prominently the service will be marketed by individual CIC libraries.

Reserves: Six of 13 libraries feature reserves on their homepages. Five libraries offer electronic reserves for at least some courses. The rest have reserve lists by courses but not the full text of the item digitized. If not on the homepage students may need to "click" up to three times to locate the reserves although it is likely that they are directed to the location of the needed reserves by faculty. Electronic reserves pose interesting issues related to scaling. Once the reserves are "up" students may access them 24 hours a day from remote locations. However, big scale electronic reserves are not common because of the labor required to mount material needed for many courses. Now, though, faculty are mounting their own reserves though not always following copyright requirements.

Iowa's TWISTed Pairs program is an example of where we've try to "scale" a number of library services on course web pages including a resources page and different types of "reserves" such as this course with images. The concept is to train faculty and/or their graduate students to do the production work and we provide a template and assistance with design and library elements.

Web Design and Evaluation

Selected CIC libraries have conducted some kind of user needs assessment related to their web pages. At Iowa we've completed user surveys to statistically significant populations of undergraduate and graduate students, and are in the process of surveying faculty/staff. In the 1998 survey of undergraduates only 9% reported using LWIS, Iowa's library web presence although 20% reported using *Library Explorer*, the general web-based tutorial. Only 6% used electronic reference. About 50% of the graduates who were surveyed a year later reported using LWIS, 12% used Library *Explorer*, and 12% used electronic mail for reference. The graduate survey did not use the name, LWIS, but asked if the respondent had "used a library web page" to avoid the name recognition problem observed when undergraduates took the survey. The University of Minnesota has a web questionnaire about findability and usage on its homepage. Other CIC libraries are planning studies, using working groups, and hiring consultants to review and propose changes to library web pages.

Appendix 1 summarizes the number of library web sites where a particular service is found, the number found on the libraries' homepage and the number of "clicks" to get to the particular service from the homepage.

Specific services: Electronic reference, library instruction, interlibrary loan, and circulation policy information were the most frequently noted service sites. However, they were not located, in most cases, on the libraries' homepages. Electronic reference was most frequently on the homepage (5 of 13). Interlibrary loan (4 of 13) and circulation policies (4 of 13) appeared on very few homepages. Circulation recalls was the next most common site (11 of 13) with circulation renewals, electronic suggestion box, campus document delivery, and acquisitions suggestions following in frequency. Other common sites include interactive library instruction, circulation renewals, reserves, disability services, frequently asked questions, electronic tours, and technical support. Less frequent were sites for research consultations, distance education or subject-specific interactive library instruction.

"Findability" Issues in CIC Libraries

Locating service sites can either be easy or almost impossible on the various CIC library sites. Two major barriers exist for users. First, the service must be found and, in some cases, important service points are imbedded in the website site requiring two or more "clicks."

The second major barrier to locating services is terminology. Although the service might be on the homepage its label may be obscure to users. Examples of this linguistic obscurity include words like "lending services" for "circulation" (which is also an obscure word to some), "library outreach services" for "distance education," "virtual reference" for "electronic reference services" and *7-Fast* for "document delivery." Librarians are becoming keenly aware of this problem and are applying new, hopefully more understandable names to the services.

Website Successes

CIC libraries reported a number of successes with their services websites. These included elevating services to a level equal to that of information resources, the ability to use electronic request forms for various services, self service features for reference and instruction, delivery of full-text content, and the ability to develop a one library view for library users entering the web space. Many libraries also reported positive experiences with web versions of their OPAC integrated into their web presence.

Website Problems

A number of common problems exist with the CIC libraries' service web sites. Users often do not understand categories where services are placed. Current designs are frequently based on the individual library's organization structure which is not intuitive to the user or does not have a bearing on their particular information need. Service features are buried. The websites contain too much information poorly placed or too little information. Several libraries indicated the need to improve design based on virtual information delivery rather than to rely on conventional models of delivery in the virtual environment. It may be that commercial sites offer some design ideas (like photographs or graphics to illustrate a product or service) however libraries have not been quick to use techniques perceived as being flashy rather than academic.

Next Steps

CIC libraries are committed to advancing web-based information services and new developments continue to appear on individual websites as more is learned about user needs and interface design. This analysis reveals a growing priority for the member libraries to bring web-based services to the forefront of their web presence in order to scale up these services to more and more library users. Though not a focus of this study the importance of marketing the sites is becoming obvious to CIC librarians based on results of user surveys and anecdotal evidence.

CIC libraries are also interested in advancing projects that promote the rich resources contained on their individual websites. Developing effective searching capabilities across CIC library websites is one such effort underway. Other projects of interest include a searchable database to electronic reference sites and improved links to digital initiatives. CIC libraries are developing strategies to advance their collective virtual presence to the next level. A major challenge for CIC libraries will be how to develop selected cooperative web-based services in a user-friendly and seamless way. Services could include cooperative reference consultation services and joint user education program development. A more multidimensional CIC library website could be developed containing not only the resources found in the VEL and the electronic web-based resources located on member library websites, but also including services and links to expertise. Place these elements in a searchable and responsive site and the scaling services CIC-wide could be fulfilled.

Appendix 1 -- Services on CIC Libraries Websites

Services	Libraries	On Homepage
Circ - policies	13	4
Electronic reference	13	5
ILL	13	4
User education	13	6
Circ - recalls	11	1
Acquisitions suggestions	10	0
Campus document delivery	10	0
Circ - renewals	10	3
Electronic reserves	10	3
Electronic suggestion box	10	4
Reserves (directory)	10	3
Disability services	9	3
Interactive library instr (gen)	9	5
FAQ	8	2
Electronic tour	7	3
Distance education	6	1
Technical support	6	1
Reference consultation	3	1
Interactive library instr (subj)	3	0

Endnotes

1 CIC Libraries include: Universities of Chicago, Illinois-Urbana/Champaign, Illinois-Chicago, Iowa, Michigan, Michigan State, Minnesota, Wisconsin, Indiana University, Northwestern University, Ohio State University, Purdue University, and Pennsylvania State University.

2 "In Search of Services: A Study of CIC Library Web-based Services," forthcoming in *Information Technology and Libraries*, December 1999.

3 *CIC Libraries Strategic Plan, Strategic Directions for 1998*,

(http://www.cic.uiuc.edu/cli/strat98.html)

4 King, p. 463.

5 Allen, B. and Prabha, C. "VEL User Study Report," (study not yet published at this writing, for more information contact Barbara Allen, Director, CIC, 302 East John Street, Suite 1705, Champaign, Illinois 61820-5698, Phone (217) 333-8475 | Fax (217) 244-7127)

6 Tennant, R. "Guest Editorial: Lessons Learned," *Internet Reference Services Quarterly* 3(2): 1-7.

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ID Number:	EDU9944
Title:	Chasms and Bridges on the Path to a New Administrative System
Author:	Ann F. Trost, J. Michael Yohe
Organization:	Valparaiso University
Year:	1999
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Chasms and Bridges on the Path to a New Administrative System

by Ann F. Trost and J. Michael Yohe

Presented to:

EDUCAUSE 99

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at
Long Beach, CA

October 25-29, 1999

- Abstract (Plain Text)
- Outline (Plain Text)
- Paper (HTML)
- Presentation (PowerPoint 4.0)
- Link to RFP Information
- VU Approach Document (HTML)

November 1, 1999

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Chasms and Bridges on the Path to a New Administrative System

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Introduction:

Many colleges and universities have converted to new administrative systems

Why is Valparaiso University's experience any different from anyone else's?

1. Support from highest levels of administration
2. Nearly 100% buy-in from campus
3. Collegial, team effort
4. Few spats
5. Friendships have survived implementation problems

Survival Equipment: Getting Ready for the Journey

1. [FEATURE] Light on the Path: Institutional Purpose
    a. Support from the highest levels of administration
    b. Campus buy-in
    c. Collegiality
    d. Strategic Plan (institutional)

2. [FEATURE] The Balancing Pole: Communication
    a. Electronic communication
        i. weekly status reports
        ii. e-mail
        iii. intranet web pages
            - minutes
            - status reports
            - documentation
            - tables
            - schedules
        iv. network directories
        v. web
    b. Face-to-face
        i. meetings
        ii. working groups

   iii. one-on-one (the only one of these that really works in sticky situations)
  c. Caveats
   i. time spent communicating is time spent not implementing
   ii. well-known scientific principle: you can't measure an object without perturbing it. Translation: you can't investigate the status of a project without delaying it.

3. The Rescue Squad: Community
   a. collegial problem-solving
   b. mutual support
   c. expressions of appreciation (deliberate and repeated)
   d. celebration
   e. open communication/expression of concerns and frustrations

4. The Bungee Cord: Maturity
   a. take responsiblity for own actions
   b. don't be afraid to admit mistakes
   c. don't hesitate to back up and get a fresh start
   d. offer and receive criticism gracefully
   e. understand this is HARD work, and there is NO easy way
   f. take time off (but judiciously)

5. The Compass: Continuous Assessment
   a. is the schedule realistic? if not, how can you change it?
   b. is the budget realistic? if not, how can you compensate?
   c. do you have enough staff? if not, can you get more? can you adjust the workload? can you hire a consultant?
   d. are people trained well enough? broadly enough?

6. The Map: Plan Ahead
   a. establish timetable
      - realistic
      - flexible
      - allow time for delays
   b. have your IT people sit in on module training
   c. hire a consultant from the company to be on site for a period of time (2-4 weeks)
   d. check schedule with colleagues in other institutions

Chasms and Bridges:

Sunrise

----

1. [FEATURE] Buy-in Gorge
   a. I don't want to change
   b. your new system doesn't meet my needs
   c. I'd rather have another system
   d. I need to go my own way with a niche system

   Bridges: Needs Assessment and Consensus Building
   a. impetus from highest levels (president, board)
   b. task force representing all interests
   c. each office review
      - existing system advantages

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  - existing system shortcomings
  - existing business processes
  - desired business processes
  - desired system features

d. task force identify conflicting needs/desires and resolve (consensus)
e. open communication with all offices, interests
f. communicate the big picture (overall institutional best interest)

2. Expectations Canyon:
a. my stuff is more important than anyone else's
b. all you have to do is plug it in and turn it on
c. a new system shouldn't require me to change
d. a new system shouldn't generate any extra work for me
e. all our needs will be met
f. everything will work perfectly the first time
g. when is IT (or someone else) going to do this for me?

The Bridges (Tightropes):
a. mediate conflicting expectations
b. plan small successes
c. reinforce community ownership

3. Culture Gully (is this the same as (1)?
a. we need complete control over our data
b. we shouldn't have to coordinate with anyone else just to make a simple change

Bridges
a. advantages of integrated system
b. establish mechanisms to facilitate coordination

High Noon
----

4. Vendor Gulch
a. My friend at another institution swears by Vendor A
b. My friend at another institution swears at Vendor B
c. Vendor C's system runs on cool hardware or software
d. Vendor D has great marketing pieces
e. Vendor E is the most popular

Bridges: The Request for Proposals and Strategy
a. process as important as product
  - involve entire institution
  - build collegiality
  - ensure needs heard

b. articulate overall features needed, such as
  - integrated database
  - web-browser access
  - security and accountability
  - network/workstation characteristics

c. document requirements specific to various offices
d. identify needs for consulting, training, conversion
e. don't forget boilerplate
  - legal clauses
  - penalty clauses
  - selection process
  - rules of the game

f. require list of references and sites to visit
g. structure into outline form, with each bullet SMART (specific, measurable, attainable, relevant, trackable) for easier evaluation

h. ask for everything you want; let vendors tell you if they can't deliver
h. be judicious in using "must," "mandatory," etc.; leave yourself flexibility
i. ask for separate pricing for discretionary features
j. send to as many vendors as you can think of; let them decide whether to participate

5. Sales Crevasse
a. the end-run (appeal to President or Board)
b. the helpful soul (offer to help you write RFP)
c. the chef (wining and dining)
d. the belittler (we don't believe in RFPs or benchmarks)
e. our system is "gonna be" so much better than anyone else's

Bridges
a. strict conflict-of-interest policies
b. write your own RFP
c. make sure highest levels endorse process
d. don't buy vaporware

6. [FEATURE] Confusion Chasm
a. proposals aren't comparable
b. they didn't answer the questions we asked
c. they all claim to do everything
d. there's so much to plow through
e. the glossy promos so impressive
f. the presentations are (too) smooth

Bridges: Critical Analysis, Site Visits and Return to Reality
a. use spreadsheets with predetermined weighting scheme to evaluate proposals
b. read responses carefully and don't give credit for innuendo and implied features
c. eliminate (or set aside) proposals not meeting mandatory requirements
d. discuss relative merits in task force, subgroups, individual offices
e. discount glossy pages and glitzy presentations
f. take everything with a Megagrain of salt
g. look harder at what they don't say than at what they do say
h. talk to your friends, not just to the references vendors provide
- EDUCAUSE lists
- conference contacts
- professional society contacts
- friends of friends

i. visit several sites
- task-force visits
- user office visits

Afternoon
----

7. Neophyte Ravine
a. learning a new system is too difficult
b. learning a new system takes too much time away from the real work we have to do
c. I don't understand the new system
d. I don't like the new system
e. the new system can't do what I need done
a. I'm used to acting independently; doing my own thing

The Covered Bridges

a. training may seem expensive, but it pays
b. if the new system won't save work in the long run,
   you probably don't need it.
c. focus on success stories from other institutions
d. collegiality (commiseration) spans the deepest clefts
e. build new culture for integrated system with understanding that
   individual changes affect entire system

8. Implementation Abyss:

a. set-up mistakes
b. incomplete/inaccurate conversions
c. data going to wrong place
e. reports don't look like they used to
e. didn't start early enough

The Rope Bridges

a. take time to do set-up properly
b. coordinate set-up with all interested offices
c. don't be afraid to ash-can false starts
d. define conversions carefully; know where the data is coming
   from and understand where it is going
e. state explicitly who does what (each office, University
   as a whole, vendor)
f. focus on function rather than form (of reports, for example)
g. use technology effectively

Dusk

9. Results Harbor: The Golden Gate Bridge

a. things that are supposed to work, do
b. existing processes streamlined
c. new processes become possible
d.

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by

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Introduction

Valparaiso University is a small, comprehensive university with an enrollment of about 3700 students in undergraduate, graduate, and law school divisions. The University is located in Northwest Indiana, 60 miles from Chicago and 15 miles from Lake Michigan. We are in our very first 'live' semester using a new administrative software system.

Many colleges and universities have converted to new administrative systems, and many of them have made presentations at various conferences. Why is Valparaiso University's experience any different?

We haven't done the job overnight. We've been at it formally for nearly two years; informal discussions, meetings, and some preparation have extended over four or five years. At the same time, people who have been involved in major conversions and know something of our starting point have told us that we've moved along remarkably quickly.

Moreover, the atmosphere has remained generally positive and working relationships have remained collegial through the difficult process of implementing the new system.

We believe the things we did right and those that we didn't can help others bridge the numerous chasms that obstruct the path to a new administrative system.

There is one principle that undergirds our successes: this is about ***people***, not technology.

Survival Equipment

The path to a new administrative system is perilous. We offer several items of survival gear for your consideration:

1. **Light on the Path: Institutional Purpose**

   Only in the context of a well-defined sense of purpose can such a project hope to be successful. You need strong support from the highest levels of administration; and the campus as a whole must buy into the project concept. Some offices may even need to sacrifice comfort and benefits of the legacy system(s) for the common good. A shared vision of overall institutional mission and direction -- as would develop in the strategic planning process, for example -- fosters the needed spirit of teamwork.

Our experience:

Ever since our current President was installed in 1989, he has worked for an integrated administrative computer system. The 1991-95 strategic plan both reaffirmed the shared vision for the University and identified a campus-wide administrative system as a major objective.

2. The Balancing Pole: Communication

Take your cue from Madison Avenue: to get people's attention, communication needs to be frequent, repetitive, and perhaps even annoying.

Use electronic communication to its fullest: e-mail; shared directories; intranet spaces, and so on. It's fast, efficient, self-documenting, and (relatively) nonintrusive.

Face-to-face communication is vital, though, to feed the spirit of teamwork and collegiality. Meetings, workgroups, and one-on- one sessions are all needed; indeed, the latter is the only method of communication that will really work in some situations.

That said, communication only lubricates the machinery; it doesn't provide the fuel. Time spent communicating is time spent not implementing; both those who are designing the processes and those who are engaged in the heads-down "grunt work" need to be spared unnecessary interruptions.

Our experience:

We used mail lists for each committee and subcommittee; a shared network directory for process mappings, meeting minutes, drafts of tables, error reports, and more; and an intranet Web site for posting weekly status reports, minutes of the weekly core team meetings, and other information of interest to the broader community.

We meet weekly to keep each other up to date on our individual problems, progress, accomplishments and discoveries. This is important to keep each other's spirits up and renew our determination to see the project through.

3. The Rescue Squad: Community

Someone once handed us a tied bundle of sticks and asked us to break them. We couldn't. He then took the bundle, untied it, and easily broke the sticks one by one. The ties of community are vital in this enterprise. They are built by collegial problem-solving; working with colleagues; mutual support; expressions of appreciation -- deliberate and repeated; open expression of concerns and frustrations; and, yes, celebration.

Community needs to include not just those who are working on the project, but the entire campus community. Those institutions fortunate enough to have a President who continuously builds community have an incalculable advantage.

Don't expect those who aren't directly involved in the project to have an inkling of what's involved, though. They won't; they can't. And part of preserving community is knowing how and when to bite your tongue.

Our experience:

We named ourselves ACT -- Administrative Computing Team -- to convey the spirit of cooperation and community in our working toward a common goal. And we kept that commitment when we worked in smaller groups (also called teams).

A lot of informal, one-on-one encouragement, training, and explaining has taken place and will continue to do so. New bonds of friendship, support, and understanding have formed and strengthen our determination. An understanding of how the different parts affect each other and fit together has developed and reinforces the team effort.

4. The Bungee Cord: Maturity

If community ties individuals together, maturity is what makes them fit into a neat package.

The members of the community need the maturity to take responsibility for their own actions; to admit mistakes; to back up and get a fresh start when necessary. They need to offer criticism gracefully and receive it graciously. This project is hard work; there is no easy way out. There is no sense in making it even harder by wasting time and energy trying to cover up or pin blame on others.

It is important, even -- or especially -- in the midst of the pressures of such a project, to remember to keep our lives balanced. Or, should we say, to insist that others around us do that, so someone will insist that *we* do. Left to our own devices, most of us won't.

Our experience:

Sometimes key administrators haven't understood why their area didn't get priority at the time they wanted it. Generally, these issues have been resolved rather easily by face-to-face communication. We've had only one mediation meeting, which addressed the issue at hand and also strengthened our resolve to try to forestall such meetings in the future.

5. The Map: Plan Ahead

Project planning is essential. You need to learn what tasks must be done; in what order; and how long each can be expected to take. The vendor may be of some help, but by all means use your personal networks -- everyone on the team. Our experience suggests that not all of the vendor's employees have been through a conversion/implementation.

Establish a timetable that is realistic, flexible, and allows for delays. Include plenty of time for training (and assume there will be delays there, too); for scheduling vendor consultants; and for redoing things that didn't work the first or second time. Again, your friends are a good source of information on the particular pitfalls of the system you select.

Our experience:

*Our timetable was ambitious and required a *lot* of hard work in too short a time, with no "buffer zones." Thus, delays in one area affected completion of tasks in another.*

We tried hard to stick to the timetable we established, but at the expense of long days, long weeks, and limited time away from the task. Some things slipped, but we met our goals for financial systems (July 1998) and student systems (fall term 1999).

6. The Compass: Continuous Assessment

We lay out schedules and plans and budgets, only to have them go awry. We know that will happen; the question is, how will we respond when it happens?

Complaining doesn't accomplish much of value. Encourage a positive approach:

- If the schedule is no longer realistic, work out acceptable ways to change it.
- If the budget turns out to be inadequate, devise ways to compensate.
- If staff is stretched too thin, see if you can hire more; or adjust the workload; or hire a consultant; or use student help.
- If people are not trained well enough or broadly enough, work out more training -- from outside or by insiders who are already well-versed.

There will be problems. The approach to their resolution tends to be a self-fulfilling prophecy. A "can-do" attitude, does.

Our experience:

Of course we wish that we had more time, more money, and more staff. But we have done well with what we have and continue to find ways to adjust and adapt and help each other along.

Chasms and Bridges:

Sunrise - The Beginning

1. **Buy-in Gorge**

Momentum -- the natural tendency of an object in motion to continue to move in the same direction -- and inertia --the tendency of an object at rest to remain at rest --are forces as powerful in the human psyche as they are in the physical world. People don't want to change. Most won't phrase their feelings exactly that way, though; more commonly, we hear "this doesn't meet my needs" and similar rationalizations. One of the first obstacles encountered in this process is getting buy-in from the campus community.

Bridge: Needs assessment and consensus building.

- Those who see the need must sell the rest of the community on the benefits of making a change. Naturally, it helps if the President and/or the Board take leadership in this effort.
- Each office should review advantages and shortcomings of existing systems and present business processes, and define desired business processes. Desirable features of a new system will emerge.
- A task force representing all interests can then review the needs of individual offices and build a composite image. This process naturally flows into coordination of business processes among different offices and resolution (or at least identification) of conflicting needs.
- Such a task force may seem so large as to be unwieldy. If so, break it into subgroups; but don't intentionally leave anyone out (you'll have enough fun making teammates out of interests you UNintentionally omit).
- If the sum of the subgroups is too large to promote meaningful discussion and communication, consider designating one or two coordinators from each to meet as a "core team."

Our experience:

This was about 95% successful. We started with a large task force; identified teams for Institutional Advancement, Student Services, Finance, Human Resources, and Technical; and brought team leaders and other resource people together as a Core Team. We initially omitted some key players -- Physical Plant, for example -- but added them later (though not before our omission caused ripples).

By the time we were ready to take on the project, most users had already recognized the need to change. The hardest offices to convince were those using legacy systems which had been specifically developed and tailored to their needs.

2. **Culture Gully**

If you are moving to an integrated system for the first time, be aware that the culture change will be at least as difficult as the technical implementation. People on campus may be used to having complete control over "their own" data, and may also be used to making major changes without any need to coordinate with, or even notify, anyone else. Even if everyone buys into the project, habit alone can go a long way toward corrupting the best-laid plans.

Bridge: Enlightened self-interest

- Make sure everyone understands and is reminded of the advantages of the new system. Early examples help. Can someone stop maintaining a local database or spreadsheet because all the information is now in the system?
- Document your standards carefully. It's easier to maintain (and enforce!) consistency if expectations are clear.
- Insist on training. Guesswork has repercussions.
- Start small and expand. Authorize rights and permissions as needed.
- Turn on the audit trail so you can find out who did what. Fear of discovery is a powerful motivator.

Our experience:

This was an oops. We thought we had it covered, but underestimated force of habit and overestimated campus understanding of our rhetoric about the advantages and requirements of system integration. We probably also overestimated the effectiveness of our communication.

A campus culture will not change overnight. One office developed tables for their use that had implications for institutional research and the way data was to be collected and reported later. Because these other interests were not consulted, we had to backtrack and rewrite the tables. When offices are not used to sharing databases, it is difficult to instill the habit of communication and collaboration.

Ownership (read power or control) is hard to give up if it's always been yours.

3. **Expectations Canyon**

Expectations beget ulcers. Let them be someone else's. Some common ones (and you can add others):

- everything will be new but nothing will change
- all you have to do is plug it in and turn it on
- everything will work perfectly the first time
- the new system will meet all our needs

Add the natural viewpoint that "my office and my work are the most important," and the natural conclusion is that all it should take is a finger-snap to resolve any difficulties or shortcomings that arise.

Bridge (oh, all right. Tightrope): Reality.

- Reinforce community ownership and the interaction of the various parts of the system.
- Mediate conflicting expectations. Set up an appeals process; preferably not too formal, so it doesn't become adversarial.
- Focus on success, and divide the tasks so there are many small successes. Make each success a visible step toward the goal.
- Be open about failures. You will have them. Let others rejoice in yours.

Our experience:

Our sense is this started off on the right foot. After a couple of years, though, we found patience wearing thin in places; primarily, it seems, where there was misunderstanding or perhaps nonacceptance of the nature and extent of the work that would be required of individual offices.

We did celebrate our milestones in several ways: chocolate surprises at weekly meetings; annual picnics; lacquered cookie bouquet and other floating trophies; T-shirts; birthday mementos; "campaign" buttons; and other tangible "rewards" for progress.

High Noon - On The Way

The next part of the journey is bathed in the blazing sunlight of competition. Beware of these pitfalls:

4. **Vendor Gulch**

The vendor you select should be the one who can best meet your needs; but those on your campus who have experience (or friends who do) with the kind of system you're seeking are bound to have opinions, pro and con, about various vendors.

Usually, strong opinions are based on personal experience. Even so, beware. On one occasion, one of the authors was excited by the opportunity to buy a system he had used in another place -- until he found that all the things he liked about that system were local code, and the "vanilla" system was completely different from what he had experienced.

Friends' opinions, pro and con, are valuable, but not necessarily applicable. Bear in mind that they are reacting to their own situation and their own customization (and release) of the system they are using.

Other influencing factors may be the buzz-word quotient, popularity or perceived sophistication of certain vendors, vendor promotional materials, or ties to specific hardware, operating systems, or database software.

Bridge: The Request for Proposals (RFP) and strategy

Replace subjectivity with objectivity: write down everything you need or want, and let the vendors tell you how close they can come to complying. There are many RFPs available and a number of papers have been written about preparing an RFP. Some pointers that may be a bit on the unusual side:

- The process is as important as the product. If you involve all the stakeholders, people will (generally) feel their needs have been heard and they are part of the team. Sure, start with somebody else's RFP; but make it clear you're using it as a starting point, not as a finished product. You may even want to start with an electronic copy and rough it up a little or insert some absurdities, just to get people's attention.

- Make sure you state features you need clearly enough that vendors who can't meet your requirements will opt out. This saves your time and theirs.

- Have the various offices document their own specific requirements. The "RFPmaster" will, of course, need to combine redundant statements and edit for style.

- Make sure to include consulting, training, and conversion needs. For most of us, their cost will rival that of the software.

- State, in general terms, the rules of the game, including vendor requirements and selection process. (Then stick by them). You're under no obligation (in most places) to share your evaluation scheme, though, no matter how cajoling or demanding the vendors may be.

- Make sure you specify that reference checks, site visits and recommendations of other users will carry significant weight in your evaluation.

- Structure your RFP into outline form for easier evaluation, and insist that vendors respond point-by-point, with their responses labeled the same as the RFP.

- Use "must," "mandatory," etc. only when you really mean it.

Our experience:

This part of the project worked very well for us. We "borrowed" RFPs from a couple of other institutions and merged them, adding some personal experience. Then we turned the Core Team loose on it. The result was reasonably complete, though we left out language specifying ease of use in some important areas, and neglected to specify the amount of background and experience we expected of vendor consultants.

Our RFP was extensive, and space does not permit further discussion. We will be glad to share the RFP and the evaluation spreadsheets with other colleges and universities.

5. **Sales Crevasse**

You are also likely to be under pressure from vendors to make a subjective selection. Some vendors may offer "sweetheart" deals if you forgo comparisons; others may lobby with your upper administration or board.

The sales people are there to curry your favor. They may want to pick up dinner tabs, shower you with gifts (emblazoned with their logo, of course), or whet your appetite with visions of the future according to their corporate Nostradamus.

Bridges: Maintain objectivity

- Most institutions have fairly strict conflict-of-interest policies, but they generally boil down to a rather simple principle, which we recommend whether or not it's stated policy: don't become indebted to any vendor.
- It's fine to pick vendors' brains. You may even want to invite vendors to campus before you write your RFP just to see what they have to offer or tout. But write your own RFP. That way, you can include everybody's best ideas.
- Make sure the upper levels understand and endorse the RFP process. They're probably going to be on one side or the other, and you want it to be yours.
- Don't buy vaporware unless you're ready for a career change. Promises might materialize; then again, they might not.

Our experience:

Another thumbs-up. We had opportunities to frustrate our objectivity, but stood firm. Support of the upper administration was important here.

We had a request from one vendor to spend a week on campus to "get to know us" better so that they could better meet our needs. We declined, indicating that we would have to allow all vendors this opportunity and it would not fit our time line.

6. **Confusion Chasm**

If you don't disqualify proposals that fail to follow your outline, you'll find that proposals aren't comparable and evaluation will be a nightmare. Some vendors won't answer the questions you asked (and will answer a whole bunch you didn't ask); and it will be almost impossible to dig the needed information out of their responses.

Bridges: Critical Analysis, Site Visits and Return to Reality

Here's where your care in assembling the RFP pays off. You will be able to create an evaluation instrument (preferably, at the same time you write the RFP) that can help reduce the confusion and promote thorough evaluation.

Some pointers:

- Use spreadsheets with predetermined weighting scheme to evaluate proposals.
- Read responses carefully and don't give credit for innuendo and implied features. If they don't say explicitly that they meet a particular requirement, assume they don't.
- Eliminate (or set aside) proposals not meeting mandatory requirements.
- Discount glossy pages and glitzy presentations.
- Look harder at what they don't say than at what they do say.
- Talk to your friends, not just to the references vendors provide. Value your EDUCAUSE mailing list contacts, conference contacts, friends from other professional societies, and your friends' friends. These people are apt to give you a balanced answer. But be sure they're talking about the proposed system, not some previous version or totally different offering from the same vendor.
- Visit several sites. Send your task force and/or delegations from individual offices.
- Discuss the responses and the research freely among yourselves.

Our experience:

This worked well for us. Particularly useful was the evaluation scheme and the spreadsheets to support it. Weighting schemes can be difficult to build; we were careful not to try to assign relative weights to every pair of minor points in the entire RFP. Instead, we structured the proposal as a *tree; the main proposal had several topics, and each of these had subtopics, and so on until all branches had been extended as far as necessary. Then relative weights were assigned to the subtopics at each level. The only relationship between "leaves" belonging to different main topics was the relative weights assigned to those main topics.*

Each member of the Core Team received a copy of each proposal and evaluated the proposal by assigning a numerical "grade" to each item. The evaluation spreadsheet formed the composite score.

There were few real surprises; most members of the team agreed on most points, but the scheme gave the evaluation credibility in the task force and in the University as a whole.

Afternoon - Are We There Yet?

You've selected your new system. You're on higher ground now, which means the chasms deepen. The work begins; the change looms; and fear strikes at the hearts of nearly everyone.

We will mention only in passing the sheer volume of work that needs to be done. If you've been there, you understand; if not, we can't explain. Count on lost vacation, lost weekends, long days, and large antacid bills.

There are a couple of avoidable sunderings of the path, however.

7. Neophyte Ravine

At this point, nearly the entire campus is confronted for the first time with the reality that they will be leaving the familiar habitat and entering uncharted territory. That realization produces anxiety in all of us; some handle it better than others. Expect to hear protests such as, "The new system can't do what I need done" (whether they know that for sure or not).

The Bridges: Training, Successes, Mutual Support

The major problem is fear of the unknown; so it follows that the way out is to make as much known as possible, and allay fear where territory remains uncharted.

- Training may seem expensive, but it pays. You're investing a bundle of money and other resources in the new system; don't waste it trying to figure things out all by yourself.
- Make sure people understand the benefits of the new system. if the new system won't save work in the long run, you probably don't need it.
- Focus on success stories from other institutions.

- Collegiality (commiseration) spans the deepest clefts. Everyone needs encouragement at times; just knowing others are seeing the same chasms helps.
- Build the culture for the integrated system on the foundation that individual changes affect the entire system -- and why that is the case, and the benefits.
- Plan for frequent, if not earth-shaking, successes. We can't expect to leap the gorges in a single bound; the bridges are built girder by girder.

Our experience:

We thought we bought a generous amount of training. It wasn't enough; it wasn't timed properly; and we didn't immediately follow it with hands-on experience to reinforce it. If we could do it over, we'd hire and train a full-time trainer for at least the basic stuff everyone needs to know.

One difficulty we ran into was scheduling the training at an appropriate time. When the trainer could come, we were extremely busy; we when had time for training, no one was available to come from the vendor.

8. **Implementation Abyss**

Implementation is not easy. Errors in setting up the system, incomplete conversion specifications, dirty data in the legacy system, and misunderstandings about the uses of fields in the new system will all take their toll.

In addition, there will be pressures to make the new system look (and maybe even behave) just like the old one; time spent doing this or resisting it will delay implementation, too.

Bridges: Method

Minimizing implementation problems boils down to one thing: be excruciatingly methodical. Inhumanly methodical.

We recommend using modern tools such as intranet spaces for developing codes, procedures, and other implementation activities. This makes the information instantly available to everyone, and enables the use of powerful global search and extraction capabilities which may not be available within the system.

Some additional pointers:

- Define conversions carefully; know where the data is coming from and understand where it is going; and make sure each person involved understands the *purpose* of what they're doing, not just the mechanics.

- Take time to do analysis and setup properly (machines, system software, and applications).
- Determine explicitly who does what (each office, University as a whole, vendor).
- Focus on function rather than form (of reports, for example)
- Don't be afraid to ash-can false starts. Sometimes it's easier to start over than to fix.

Our experience:

We had some useful methods and organization; we just didn't start early enough. We also didn't have a complete data element dictionary for the legacy system, so found ourselves groping in the dark some of the time. Our first conversion was as close to disaster as we care to get. After that, we were more methodical in our conversion mappings and things went much better. We had some delays, though, because we did not understand the vendor's "source" file for conversion was what we were calling an "intermediate" file; other delays because of misunderstandings about who would do what or about the meaning of data fields; and still others due to changes we made in codes after the conversion was mapped but before it was run.

Implementation is difficult, even if you have superusers who are familiar with the data and its location in your legacy systems. You have to make decisions about where the data goes before you know the new system very well. And the vendor's mapper, who knows the new system, will not know your legacy system setup or organization. The best advice we can give: question everything!

Results Inn

Dusk - A Time For Reflection: A View of The Golden Gate Bridge

You have arrived when the things that are supposed to work, do; existing processes become streamlined; and new processes become possible.

You will never be "finished." One of your objectives was undoubtedly to team up with a vendor who would keep you up to date with technology; and this means frequent change.

You will discover new ways to use the system, and applications that had not been imagined. These additional applications will keep the pot stirred.

Institutional business practices change, and may change more frequently now that offices can write their own rules and reports rather than relying on the central programming staff.

Our experience:

We will probably spend the next year getting our processes up to speed on the new system, continuing to evaluate the way we do business, and catching up with report writing. Ten years worth of queries cannot be replaced overnight, but they can be analyzed for their logic which may or may not fit the new system. We will maintain our weekly Core Team meetings to share the joy of discovery (and the agony of defeat, if necessary). By this time next year, we'll be through the really hard stuff at least once, will feel much more comfortable with the new system, and will have developed a terrific support group to get us through the tough periods.

We wish you well on your journey!

October 27, 1999

VALPARAISO UNIVERSITY APPROACH DOCUMENT

I. BACKGROUND

The current University information system has evolved over many decades at the direction of many individuals. It is currently a combination of CMDS modules and modules written in-house. The result is a fragmented information system which may serve many of the needs of the University, but which is difficult to modify to accommodate new needs. The present information system contains modules which have software errors in them, creating unnecessary difficulties and frustrations. In addition, the present system was developed prior to the massive introduction of PCs into the administrative areas. These workstations offer opportunities for information processing which were impossible a few years ago. The present information system was not designed to take advantage of these capabilities.

In September 1995 President Alan Harre appointed the Administrative Information Processing Task Force to reexamine the information needs of the University and develop a plan for better meeting these needs for the next ten years. The Task Force membership included broad representation from the Business Office, Institutional Advancement, Admissions, Student Affairs, Financial Aid, School of Law, Graduate Office, Human Resources, Registrar's Office and Electronic Information Services (EIS).

The charge to the Task Force included the following:

1. To define the strengths of the current information system;
2. To define the needs not being met by the current information system for all functions of the University dependent on information;
3. To define the objectives of the new information system;
4. To evaluate alternatives for meeting the objectives of the new information system;
5. To develop RFP specifications for vendor solutions;
6. To receive and evaluate vendor proposals;
7. To make recommendations to the President.

The work of the Task Force was completed in August 1997 with the selection of Datatel as its vendor and the signing of a contract with Datatel. VU decided to implement the Datatel system, known as *Colleague (Benefactor* is the name of the Institutional Advancement module*)*, as an integrated vendor solution for replacing the current administrative systems at the University. An integrated solution will ensure that data is properly recorded, not duplicated, and easily understood throughout the user community. While implementing a new system, the University will review current business practices and policies to ensure that all practicable efficiencies are achieved. The new systems will replace the following systems at VU: admissions, financial aid, registration, student accounts, housing, alumni/development, finance and human resources/payroll.

II. PROJECT GOALS

VU Mission Statement

The following Mission Statement guides the University's 1993-1999 Strategic Plan:

Valparaiso University, a private institution of higher learning distinguished by its Lutheran heritage of scholarship, freedom, and faith, provides strong programs of liberal and professional studies well-grounded in the arts and sciences by a faculty dedicated to challenging teaching and care for the individual in a residential setting where its students can develop as whole persons, motivated and prepared to serve both church and society.

VU Strategic Planning Goals/Directional Themes

During the 1990s, three supporting emphases will make extensive contributions to enable the University to realize its most significant aspirations. Valparaiso University will:

- encourage the optimal deployment of its resources. It will review thoroughly its academic, administrative, and support staff programs and services to foster an environment that eliminates duplication and values quality and high productivity. When necessary, Valparaiso University will reduce or delete programs and services that are less central to its mission, while strategically maintaining, enhancing, or initiating others.
- provide students, faculty, and staff with an environment needed to support learning, teaching, scholarship, and service through enhanced library resources and judicious employment of electronic information technologies.
- seek continuing financial support from alumni, friends, and others, pursue new sources of financial support, and encourage and support creative methods of acquiring the financial resources necessary to enhance the teaching-learning environment.

Datatel Project Mission

The Datatel project mission is to provide a complete, effective, integrated, easily-accessed, easily-used administrative information system to Valparaiso University by July 1, 1999.

Project Goals

The goals of the *Colleague/Benefactor* implementation project include:

1. Improve services to external and internal customers;
2. Increase faculty, administration, staff access to reliable, consistent, and timely data;
3. Provide students direct access to appropriate information;
4. Provide access to timely and comprehensive management information for use in the decision-making process;
5. Review all processes affected by the Datatel project and improve them as appropriate.

Measurement Of Success

VU will succeed when...

- external customers are satisfied.
- internal customers willingly accept the new work methods.
- employees are productive and find the *Colleague/Benefactor* system to be an asset in their work.
- employee efficiency and effectiveness are exceptionally high.
- students and departments have ready access to pertinent information.
- each office has developed its own procedures manual.

VU will achieve this through...

- teamwork, support and encouragement.
- effective communication.
- training, training and more training.
- strategic planning.
- adapting to the change.
- the hard work of employees.
- process improvement.

We will measure the success of this project in three different stages:

- **Phase I:** Each of the following modules is running on Datatel software: Finance, Institutional Advancement, Human Resources/Payroll, Student Systems.
- **Phase II:** Each of the systems listed above is operational at the current level of effectiveness on the Datatel software.
- **Phase III:** All members of the University community have the confidence that the data that they need will be reliably available, when and how they need it.

III. IMPLEMENTATION APPROACH

Time Line Targets

The following schedule for live implementation of the systems has been established:

- Financial module July 1, 1998
- Institutional Advancement module September 1, 1998
- Admissions submodule July 1, 1998
- Human Resources module January 1, 1999
- Financial Aid submodule January 1, 1999
- Remainder of student module July 1, 1999

Stewardship (Ownership)

Offices will assume primary responsibility for the content of and access to data elements as decided in the implementation process.

Offices will take ownership of their application software. Thus, users of the system, not EIS, will be primarily responsible for establishing codes and setting parameters, activities that determine how the system will function; and for security, backup, and disaster recovery planning for their own workstations. EIS will assist users with these tasks. Its primary responsibilities, however, will be:

1. To work with users and Datatel to resolve application software problems and satisfy unmet application software needs;
2. To be a resource to users regarding global issues such as understanding the application software user interface, use of the query language and the integration of modules and systems;
3. To ensure that the system software is configured and functioning effectively;
4. To ensure that all hardware is adequately scaled and running efficiently;
5. To provide security, backup, and disaster recovery planning for servers, central software, and primary data;
6. To be the focal point for training on the common portions of the system.

Role Descriptions, Responsibilities, And Membership

Steering Committee

The Steering Committee will guide the project. The Steering Committee is composed of the former members of the Administrative Information Processing Task Force, now appointed as a continuing committee known as the Administrative Computing Team (ACT).

- Jim Albers, Dean of Graduate Studies and Continuing Education
- Joanne Albers, Registrar, School of Law
- John Bowker, Director of Information Systems, Institutional Advancement
- Stephanie Coyle, Director of Human Resources
- Bill Doshan, Associate Director of Management Information Systems, EIS
- David Fevig, Director of Financial Aid

- Karen Foust, Director of Admissions
- Debbie Gleason, Assistant Director of Admissions, School of Law
- Luci Hicks, Assistant to the Dean, College of Arts and Sciences
- Bonnie Naumann, Director of Support Services: Purchasing, Mail Center
- John Obermann, Network Administrator, School of Law
- Chris Rasmussen, Assistant Dean of Students for Residential Life
- Greg Rutzen, Associate Director of Alumni Affairs
- Susan Scroggins, Assistant Controller for Students Accounts
- George Sperry, Acting Director of Management Information Systems, EIS
- Ann Szumski, Administrative Assistant, Graduate Studies and Continuing Education
- Ann Trost, University Registrar, Chair of the Steering Committee (ACT)
- Dianne Woods, Assistant Controller for Financial Accounting and Reporting
- Mike Yohe, Executive Director of Electronic Information Services
- Jan Zoladz, Administrative Assistant for Finance, School of Law

Executive Committee

The Executive Committee will function to assign/empower those charged with implementation; reinforce the priority of the implementation project; ensure that necessary resources and support are provided to

teams/offices/departments; resolve problems/conflicts presented by the project leader/team leaders, if unable to resolve at the team or steering committee level; receive periodic updates of project progress; communicate policy, where appropriate; communicate implementation project progress, where appropriate; promote project achievements and results; schedule and enjoy success celebrations. The Executive Committee is composed of the following people:

- Roy Austensen, Provost and Vice President for Academic Affairs
- Charley Gillispie, Vice President for Administration and Finance
- Mike Yohe, Executive Director of Electronic Information Services
- Bill Doshan, Associate Director of Management Information Systems, EIS
- Ann Trost, University Registrar

Project Manager

Mike Yohe, Executive Director of Electronic Information Services

The project manager leads the implementation effort and is responsible for ensuring that the project progresses according to the implementation plan. The project manager works closely with Datatel employees, the president, the steering committee, the implementation teams, and the EIS team to prioritize and schedule tasks, to anticipate and mitigate conflicts, and to ensure timely progress toward full implementation.

EIS Project Manager

Bill Doshan, Associate Director of Management Information Systems, EIS

The EIS project manager is responsible for data conversion, hardware, and technical issues.

Steering Committee Chair

Ann Trost, University Registrar

The Steering Committee chair is responsible for communication between teams and to VU staff and for facilitation of the steering committee (ACT).

Team Leaders

The team leaders serve as the team facilitator and as a liaison to and member of the Core Module Implementation Team. Each team leader will seek out expertise as identified by the team.

Team Responsibilities

Teams are responsible for interfacing and converting their area of responsibility to the new system.

Each team is empowered to make decisions that affect their area of responsibility without prior approval of the steering committee. Decisions that affect more than one team must be made with the involvement of all affected teams. Decisions that affect more than one system must be made with the involvement of all affected Systems Teams. Any exception that impacts University policy or would extend the project time line must be reviewed by the steering committee.

Each team is empowered to resolve its own conflicts subject to the communication protocol described below. Conflicts that cannot be readily resolved must be addressed by the Steering Committee members.

Teams are responsible for developing and entering the codes associated with their modules.

The initial team memberships consist of the following members of the ACT and are to be supplemented as the team sees fit. Team leaders will be chosen by the teams.

Core Module Implementation Team

- John Bowker, Benefactor Team Leader
- Stephanie Coyle, Human Resources/Payroll Team Leader
- Bill Doshan, Associate Director of Management Information Systems, EIS
- David Fevig, Student Systems Team Leader
- Susan Scroggins, Finance Team Leader
- Ann Trost, University Registrar
- Mike Yohe, Executive Director of Electronic Information Services

Finance Module Implementation Team

Susan Scroggins, Leader

(General Ledger, Purchasing, Accounts Payable, Physical Plant, Inventory, Budget Management, Fixed Assets)

- Kathryn Carpenter, University Librarian
- Wendy DiMaio, Accounting Assistant, Administration and Finance
- Sue Dunlap, Director of Dining Services
- Bonnie Naumann, Director of Support Services: Purchasing, Mail Center
- Fred Plant, Director of Physical Plant Services
- Susan Scroggins, Assistant Controller for Student Accounts
- Dianne Woods, Assistant Controller for Financial Accounting and Reporting
- Jan Zoladz, Administrative Assistant for Finance, School of Law

Benefactor (OIA) Module Implementation Team

John Bowker, Leader

(Individuals and Organizations, Campaign Management, Gift and Pledge Processing, Major Prospects, Correspondence Control, Activities and Events)

- Michelle Bazin-Johnson, Director of Alumni Affairs
- John Bowker, Director of Information Systems, Institutional Advancement

- Lori Manfred, Campaigns and Special Project Manager, Institutional Advancement
- Linda Mullen, Stewardship Coordinator, Institutional Advancement
- Martha Murphy, Prospect Development Director, Institutional Advancement
- Greg Rutzen, Associate Director of Alumni Affairs
- Jean Sando, Foundations and Corporate Relations Director, Institutional Advancement
- Cathy Svetanoff, Annual Giving Director, Institutional Advancement
- Shirley Uber, Administrative Assistant, Institutional Advancement
- Joy Williams, Editor, ALUMnotes

Human Resources/Payroll Module Implementation Team

Stephanie Coyle, Leader

(Personnel, Payroll, Position Control)

- Stephanie Coyle, Director of Human Resources
- Laura Galinsky, Benefits Administrator, Human Resources
- Dorothy Herscher, Executive Secretary to the Provost
- Sherry Mack, Human Resources Assistant
- Karen Major, Assistant Director, Financial Aid
- Maria Martin, Payroll Manager
- Tammy Tice, Director of Housekeeping Services
- Ann Trost, University Registrar
- Lynn Wellsand, Office Assistant, Payroll
- Dianne Woods, Assistant Controller for Financial Accounting and Reporting

Student Systems Module Implementation Team

David Fevig, Leader

(Admissions, Financial Aid, Records and Registration, Accounts Receivable, Cash Receipts, Faculty Information, Curriculum Management, Campus organizations, Degree Audit, Residential Life, Activities & Events, Correspondence Management)

- Jim Albers, Dean of Graduate Studies and Continuing Education
- Joanne Albers, Registrar, School of Law
- David Fevig, Director of Financial Aid
- Karen Foust, Director of Admissions
- Anne Garmon, Assistant University Registrar
- Debbie Gleason, Assistant Director of Admissions, School of Law
- Luci Hicks, Assistant to the Dean, College of Arts and Sciences
- Darlene Leatz, Coordinator of Support Services, Admissions
- John Obermann, Network Administrator, School of Law
- Chris Rasmussen, Assistant Dean of Students for Residential Life
- Leah Sample, Assistant Director, Valparaiso Union
- Phyllis Schroeder, Associate Director of Financial Aid
- Susan Scroggins, Assistant Controller for Student Accounts
- Mary Smith, Director of Student Accounts, Administration and Finance
- Ann Szumski, Administrative Assistant, Graduate Studies and Continuing Education
- Ann Trost, University Registrar

The EIS Role

EIS is in a support role and not one of ownership of the application software. The following list is representative of areas that EIS will play a central role in providing technical leadership:

- Coordination of hardware and software installations

- Maintenance and future upgrades of *Colleague/Benefactor*
- System administration and database administration support
- Oversight of central data warehousing
- Oversight of conversion activities
- Coordination of system security and access
- Management of archival procedures
- Distribution of printing to relevant offices
- Coordination of user training
- Resolution of application software problems

EIS Implementation Team

- Dave Cooley - Database administrator
- Bill Doshan - Technical specialist
- Mike Heinold - Departmental application support
- Janet Lockridge - User support consultant
- George Sperry - Conversion specialist

Centralized vs. Decentralized

An integrated system combines the best of both centralized and decentralized approaches. A single, centralized database is the key to an integrated set of systems. This centralized database will provide one location for information as well as processing rules which specify the way VU defines and uses data. Data will be entered only once, from a number of decentralized origins (e.g., Admissions, Financial Aid, Registrar), and thereafter will be shared with many users across campus. All authorized users will have access to the same information and reporting tools, thereby eliminating duplication, confusion, and frustration.

Offices responsible for data input in the current systems (e.g., Admissions, Financial Aid, Registrar) will continue to have ownership under the new system, and some additional units may also assume data "ownership" rights and responsibilities. For all of these units, the single most important owner responsibility is and will be quality control. Shared access and use of central information resources requires reliance on the accuracy and integrity of data in the system database.

The use of *Colleague/Benefactor* and related systems will be the only official repository for all data collected and stored relating to the administrative business of the University.

Conversion

Conversion is the process of changing from the old administrative systems to the *Colleague/Benefactor* system. The implementation teams must plan the seamless move to new systems without any interruption in existing services. The conversion to *Colleague/Benefactor* will be complex and includes a number of factors. Each module team is charged with the responsibility to:

1. Decide what data is to be converted to *Colleague/Benefactor* and on what schedule.
2. Consider the key dates in the University's calendar. The calendar is complex and the affected departments have different key dates (e.g., fiscal year boundaries, registration dates, etc.).
3. Identify all data sources. The present systems have been in place for a long time. This means that there are multiple data sources to be converted, i.e., current data and historical data. Further, coding schemes and conventions for data have changed over time requiring more verification, clean-up and conversion. Data analysis needs to be performed to test the accuracy of the data.
4. Determine which data elements should be retained and establish a long-term data retention policy to guide conversion efforts.
5. Plan for technical testing and for user testing including assessment and acceptance.
6. Develop contingency plans for storing existing data in case problems are discovered later in the conversion.

In addition, the following factors will also be considered:

1. The implementation of each *Colleague/Benefactor* module will be staggered. Interim system interfaces will have to be devised and maintained by the EIS staff and Datatel consultants, so that current systems can exchange information with *Colleague/Benefactor* as they are implemented.
2. Because the conversion includes movement from multiple systems into one system, there will be instances where decisions will have to be made about precedence. For example, a student's name and address may appear in the Student Record, Development, and Admissions data base and any of these may be the most current or accurate. A plan to automate the precedence decision or to make the decision manually will be created. The Core Module Team is responsible for resolving issues of precedence.

Training

The successful implementation of *Colleague/Benefactor* is defined by its acceptance and effective use by the University's staff and faculty. Included in this definition is the requirement that the system be implemented on time and in a manner that achieves greater efficiencies of operation and higher service levels for the campus community.

Training is essential to achieving these goals and fulfilling the project's goals. Accordingly, training will take several forms, each appropriate to the tasks to be performed.

- **Implementation Plan Training** will be provided to team leaders and team members. The purpose is to give each member a full understanding of the overall system and of each module. This training will focus on procedures for making informed decisions and process improvements.
- **Technical Training** will be given to staff who will be planning and installing the necessary hardware and network systems on which the *Colleague/Benefactor* software will run and the skills and knowledge needed to maintain, improve, and troubleshoot the hardware and software during and after implementation.
- **Management Orientation and Training**, will be given to supervisors who manage staff who will also use the *Colleague/Benefactor* system on a regular basis. Supervisors will be expected to use this training to evaluate procedures for process improvement that will gain greater efficiencies and/or reduce administrative costs.
- **User "Just in Time" Training** will be provided to those who must use the *Colleague/Benefactor* system to perform the necessary day-to-day functions of their position. "Just in time" training is meant to be given as close as possible to the time the system will go live so that functions will be fresh in the user's understanding, and will not be forgotten in the interim.

The *Colleague/Benefactor* system is an essential tool provided to the University's staff and faculty to allow the effective, efficient, and accurate performance of important duties and responsibilities. Even though the use of this software and the training for its use are not specified in position descriptions, attendance at, and active participation in training, is a requirement of all who are to use the systems and are assigned to training. The level of active participation in training will be evaluated by the department head.

Security

All users will be able to view the data that is required by the user's job functions. Clearance to modify the data will be restricted according to the definitions of data ownership. All users of *Colleague/Benefactor*, including student employees, will be required to sign a University confidentiality statement. Ideally, this would be part of an employees' orientation.

All information about students, current and former, maintained by Valparaiso University is governed by the Family Educational Rights and Privacy Acts (FERPA) of 1974. FERPA requires that VU have the student's written permission to release any information from their records except certain types of "directory information."

Faculty and staff personnel records are also protected under law. Human Resources has the responsibility for these records.

IV. COMMUNICATION PLAN

Information Flow

The Executive Committee, Steering Committee, and the implementation teams will document discussions and decisions using a template for minutes (which will be posted on our Web site) to inform everyone involved in the effort about issues and progress.

The Project Manager will keep the President and the President's Council members informed regarding implementation progress and issues. He will inform implementation team members of the Council's concerns that need to be addressed.

The Project Manager will collaborate to publish regular reports and articles concerning the system's features, process improvement decisions, and implementation matters for circulation throughout the university. It will be the responsibility of each member of the VU community to read this information and keep abreast of the implementation process as it progresses.

All formal VU communication with Datatel will go through the Project Manager.

Decision Making Process

Each implementation team has the delegated authority to make the most effective decisions for each area(s) of responsibility without prior approval of the Steering Committee. As members of the team represent cross-functional units, decisions which affect more than one area must be made with the full consultation of the members. By the same token, decisions which affect more than one system must be made with the involvement of affected module teams. In such instances, the chair of the implementation team must communicate the decision points to the chair of the other implementation teams and ensure collaborative decisions.

Conflict Resolution Process

Each team is empowered to resolve its own conflicts. If the implementation teams cannot reach a consensus on certain issues, those issues must be forwarded by the chair of the team to the Steering Committee or to the Core Module Team. In the event that these two groups cannot reach a consensus on those issues, the chair of the Steering Committee will bring the issues to the Executive Committee.

V. GUIDELINES FOR THE PROJECT

Legacy Software Support

To facilitate the implementation of *Colleague/Benefactor*, there will be a moratorium beginning immediately on discretionary enhancements or modifications to the existing systems. All requests for modifications to these systems must be approved by the Executive Director of EIS and will be contemplated only in the case of serious software errors ("bugs"), normal maintenance, or where necessary to remain compliant with external requirements (e.g., the IRS).

Customizing the Software

The *Colleague/Benefactor* system will be implemented in its "vanilla" form. Where current practices are not supported by the new system, processes will be reviewed and revised, using the features available in the new system to deliver the same or improved services in an alternate way. As discussed previously in this document, process redesign and improvement will be an important component of this implementation. No custom programming changes will be made to the software without the express written approval of the Executive Committee, and no custom programming changes will be made during the first year of use unless there is no alternative.

Programming changes are defined here as functional changes to the software and do not include defining decision tables, developing new reports, creating new forms, or adding data elements, all of which will be required during the implementation process.

Reporting

Colleague/Benefactor will provide for the creation of several types of reports. Standard and ad hoc report generation facilities will be available to all users via an English-based query language tool, and key personnel will receive instruction through various training programs. More complex, analytical reporting requirements can also be accommodated through the training of VU technical staff by Datatel. An executive information system will be developed for purposes of tracking and monitoring key performance indicators and strategic planning.

The generation of statistics and reports to help monitor performance and manage processes will be facilitated as necessary during project implementation. Though efforts will be made to accommodate reasonable report requests from units across campus, it will not be possible to provide discretionary data report programming services during the implementation process.

EDUCAUSE **Information Resources Library**

Transforming Education Through Information Technologies

Abstract

Category: Papers Presented at EDUCAUSE annual conferences

ID Number: EDU9932

Title: Collaborative Support for the Distributed University

Author: Anne Agee, Keith Segerson, John Zenelis

Organization: George Mason University

Year: 1999

Abstract: The Information Technology units at George Mason University work in a dynamic and exciting environment that puts a high value on excellence in information technology programs and services. In this paper, the authors share some of the challenges of working in that environment and some of the strategies that the senior IT managers have developed to meet those challenges--collaborative staffing and programming, collaborative assessment and planning, and collaborative budgeting.

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Collaborative Support for the Distributed University

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Abstract: The Information Technology units at George Mason University work in a dynamic and exciting environment that puts a high value on excellence in information technology programs and services. In this presentation, we would like to share some of the challenges of working in that environment and some of the strategies that the senior IT managers have developed to meet those challenges--collaborative staffing and programming, collaborative assessment and planning, and collaborative budgeting.

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Overview of George Mason University

George Mason University is a relatively new institution. It began in 1957 with 17 students as the Northern Virginia two-year branch campus of the University of Virginia, offering courses in engineering and the liberal arts. During the first year of its operation, it was known as University College, but in 1958 UVA's Board of Visitors renamed it George Mason College. In 1966 the General Assembly authorized the expansion of George Mason College into a four-year degree-granting institution and gave it the long-range mandate to expand into a major regional institution of higher education. The first senior class received degrees in 1968. Graduate programs began in September 1970, with the first master's degrees conferred in June 1971. In April 1972, Virginia's Governor established George Mason University as an independent member of the of the Commonwealth of Virginia's system of colleges and universities. In 1979 George Mason was granted authority to grant doctoral degrees. In 1972 Mason enrolled 4,116 students. In the Fall of 1999 Mason has an enrollment of approximately 25,000 students (15,000 undergraduate and 10,000 graduate and professional). In addition, a significant number of Mason's undergraduates are upperclassmen, since Mason is a major transfer site for the five campuses of the Northern Virginia Community College system.

George Mason University, located in the heart of high-tech Northern Virginia, now comprises twelve academic divisions and has some 1,300 faculty, of whom more than 700 are full-time tenured or tenure track. Our academic programs include the range from liberal arts and fine and performing arts, sciences, business, law, information technology and engineering, to nursing and health sciences, education, and public policy. Our 107 undergraduate, graduate and professional degree programs are "distributed" among three campuses in Arlington, Fairfax, and Prince William counties, each with a distinctive academic focus that reflects the needs of its surrounding community and that plays a critical role in the economy of the region.

The Arlington campus, which includes the University's School of Law, focuses on law, law and economics, public policy, international commerce, and management of non-profit organizations programs. The renowned James M. Buchanan Center for Political Economy is also at Arlington as is the National Center for Technology and Law, the newest addition to this campus.

The Fairfax campus includes the College of Arts and Sciences (the largest college in the University), the Graduate School of Education, the School of Information Technology and Engineering, the School of Management, New Century College, the College of Nursing and Health Sciences, and degree-granting institutes of the Arts, Computational Sciences and Informatics, Public Policy, and Conflict Analysis and Resolution.

The Prince William campus, which includes a unique partnership with the American Type Culture Collection, the world's foremost archive of living cultures, focuses on the biosciences, bioinformatics, and biotechnology, but is also home to other academic programs such as Administration of Justice, and Health, Fitness and Recreation.

In 1997, George Mason University inaugurated its fifth president, Dr. Alan G. Merten, a dynamic academic leader with a significant background in information technology. He has made the creative use of technology a cornerstone of his plans for the University's future development – in teaching and learning, in research, and in service and community outreach endeavors.

Reflecting the significant and still growing information technology economy of Northern Virginia, George Mason University is seen as a strategic asset both by Commonwealth political leaders, as well as by corporate and business leaders of the region. Such technology leaders as Oracle, Dominion Semiconductor, UUNET, MCI WorldCom, and AOL, all are headquartered or have significant presence within our service region. The current Governor of Virginia, James Gilmore, has publicly committed to making George Mason University a top-rank information technology higher education institution in the nation. More importantly, along with the support of the General Assembly, the Commonwealth has begun to provide significant base operating budget funding increases to make this a reality. We anticipate that when the phased, four-year funding enhancement cycle is completed, the University's base operating budget will have increased by more than $25M in real dollars. If not unique, this is certainly uncharacteristic of trends among publicly supported universities in the U.S. The most significant development of the increased funding thus far has been "The Technology Across the Curriculum Program" for all undergraduate students.

Unlike other university models where there is typically a main campus and branch or satellite campuses, at George Mason we conceive of our institution as being a "distributed university." Although it is true that we operate in a multi-campus environment, we do not conceive of any of our campuses as being more important than the others. At each of our three campuses, we strive to provide students and faculty with full access to all of the University's resources, while working to minimize duplication of programs and provide required support services through the use of technology. The Executive Vice President's main administrative role is to work with internal constituencies and community and business groups to further develop and sustain the distributed university model.

All in all, these factors make working at George Mason a challenging experience for the senior management of the Information Technology group!

Structure of Mason's Information Technology Organization

During the first year of Dr. Merten's tenure as President, the university's Information Technology organization was redefined, and Dr. Joy R. Hughes was recruited to serve as Vice President for Information Technology and C.I.O. George Mason's IT organization includes University Libraries, University Computing and Information Systems, the Instructional Foundation, and the newly-established Department of Instructional Improvement and Instructional Technology (DoIIIT). In addition, Dr. Hughes oversees the University's Process Reengineering Program – an ongoing effort that is being led by a distinguished faculty member from the School of Information Technology and Engineering.

University Computing and Information Systems (UCIS)

The University Computing and Information Systems (UCIS) department has grown substantially over the past decade. With the advent of the PC and vastly improved (reliability and speed) networking, the university has developed an insatiable appetite for scalable and adaptable technologies. As the university's central IT infrastructure support organization, UCIS has moved from mainframe to distributed environments and from supporting applications like central word processing to desktop distributed applications. As well, help desk functionality was non-existent in 1990, but has not only been established, but has grown into an 8-person department successfully answering an average of over 5,500 customer IT support calls/e-mail messages per month.

UCIS supports campus data, voice, and video networking between all campuses and off-campus facilities directly to the desktop. Full ATM capability is in place with high-speed Internet and redundant links established. Besides the backbone infrastructure, UCIS also supports residence hall data/voice/CATV services, productivity application training, university administrative systems, dial-in services, video streaming/conferencing, telephony/voice mail, web application development, emerging technologies, and central mainframe/Unix/Novell environments. Additional support is provided to Mason faculty and staff supporting (installation and repair) over 5,500 PCs and over 1,500 printers. UCIS staffing consists of 90 full-time staff and 15 part-time student and professional wage staff. Total budget is approximately $8.2 million plus non-fixed annual allocations for equipment and software refreshment and infrastructure upgrades.

Technical and management staff within UCIS are very active in regional and national associations and have been successful in increasing grant allocations and partnership with regional IT companies. Currently George Mason is working with Oracle, UUNET, GTE, and several other major firms to create new and exciting research opportunities and production services benefiting both entities directly as well as Commonwealth of Virginia citizens.

Additional information about UCIS is available at http://www.gmu.edu/departments/ucis/.

University Libraries

George Mason's libraries reflect the phenomenal, parallel growth of the University. The University's library started out as a small, two-story building in 1967, to which were added two five-story additions, one in the 1970's and the other in the early 1980s. This facility--Fenwick Library--continues to function as the University's main research library. In 1995, the Johnson (University) Center Library opened its doors, equipped with state of the art information technology and featuring very attractive open as well as group study spaces, occupying one third of the overall space of this new showcase building. Both the Fenwick and Johnson Center libraries are on Mason's Fairfax campus. In Fall 1997, the Prince William Campus Library was established to serve the academic needs of the brand new campus. In Spring 1999, two very small libraries were merged into the space vacated by the School of Law Library to form the now unified Arlington Campus Library. (The Law Library, which is administered separately, relocated into the brand new five-story School of Law building next door).

In addition to its obvious real estate growth, the University Libraries has grown significantly as measured by such indicators as operating budget (currently approximately $10M /year of which more than $4M is expended on information resources); staff (144 FTE of whom 100 are full-time positions, including 38 librarians); collections and information access (more than 800K volumes, some 1.5M microforms, more than 7K current serials subscriptions, significant holdings of government documents, maps, and special collections and archives, and access to more than 300 electronic databases, including full-text and online journals, of which a good portion is available through our participation in the Virtual Library of Virginia (VIVA) Project and the Washington Research Library Consortium (WRLC). Besides the very important VIVA and WRCL affiliations, the University's current level of support for its libraries makes Gorge Mason a mid-range library among the some 45 members of the Association of Southeastern Research Libraries.

Notable strengths of George Mason's libraries include a highly effective academic department liaison program; an active and much sought out library instruction program; strategic investments in information technology; high utilization of electronic scholarly resources; a highly responsive and timely interlibrary and document delivery service, including office and inter-campus courier service; and, last but not least, ongoing overall University financial commitment to library programs and services (6.4% of E&G in fiscal year 1999-2000).

Additional information about the University Libraries is available at http://library.gmu.edu/.

DoIIIT

The Department of Instructional Improvement and Instructional Technologies (DoIIIT), the newest component of Mason's IT group, includes most of the instructional support for the University. DoIIIT manages all of the university's student computer labs and electronic classrooms and also handles the distribution of audio-visual equipment for classroom use. DoIIIT also provides training, mentoring, equipment, and facilities for faculty and students working on technology-related instructional projects through its Instructional Resource Center (IRC) and Student Technology Assistance and Resources Center (STAR). Through GMU-TV, DoIIIT also has responsibility for the production of instructional video materials.

Among the three campuses, DoIIIT manages 13 general University computing labs with more than 400 workstations. In addition, DoIIIT maintains four special, mentor-supported labs for students working on technology-related projects and a fully staffed instructional resource center lab for faculty. It also supports 19 electronic classrooms and 23 smart classrooms with enhanced presentation capabilities.

DoIIIT has a staff of 34 FTE in its five units. In addition, DoIIIT employs more than 100 students as lab assistants, office assistants and mentors in its various facilities.

DoIIIT has an annual budget of $2.6 million to support its programs and services plus non-fixed annual allocations for equipment and software.

Additional information about DoIIIT is available at http://www.doiiit.gmu.edu.

The Instructional Foundation

The George Mason University Instructional Foundation, Inc., is a non-profit 501 (c) 3 Virginia Corporation formed solely to benefit George Mason University both monetarily and with in-kind contributions.

The Foundation operates The Capitol Connection, a wireless cable system serving over 1,700 business and government patrons throughout the Washington, D.C. metropolitan area. The service provides C-SPAN,

C-SPAN2, CNN, CNBC, the televised open meetings of The Federal Communications Commission, the Federal Energy Regulatory Commission, and the National Transportation Safety Board. George Mason University televised graduate and undergraduate courses for credit are also carried on The Capitol Connection service. The Foundation holds over 20 microwave television licenses in the metropolitan area, and delivers George Mason University Television programming to cable system headends

in Arlington, Fairfax, Loudon and Prince William counties and in the Cities of Alexandria, Fairfax, Falls Church, Manassas and Manassas Park, as well as the towns of Leesburg, Reston, and Vienna. The Foundation is also the sole stockholder of F Corporation, a for profit Virginia stock corporation which is licensed by the FCC to operate a C-Band satellite uplink from the campus of George Mason University which serves not only university users, but a variety of regional users including Fox Television, and the Arlington and Fairfax public schools.

In addition to its annual monetary and in-kind contributions to the university in excess of $1M/year, the Foundation brings goodwill and publicity to the University with some of the country's most powerful players, including the White House and Cabinet members and large law firms, trade associations, and major news organizations.

Additional information about the Instructional Foundation is available at http://www.capitolconnection.gmu.edu.

Issues in Dealing with the Distributed University

As the University grows, the IT units are coping with the classic problems of getting sufficient technology and staff resources to support it. While the University and the state have provided funding for technology infrastructure and equipment, they have not always provided adequately for the cost of academic support issues. The net effect is that the IT units have been required to stretch existing resources in order to respond, at some level, to increased service demands. This is particularly evident at the newer and still developing distributed campuses.

Fortunately, increased state funding has been established and targeted for use to address academic programs with a technology focus. This focus has allowed the IT units a greater opportunity to make the case, with some measurable success, for staff funding and program activities as well as directly supplying hardware, software, and other resources such as electronic databases.

Realizing the mandate of the distributed university, namely to provide an equal level of services to students and faculty regardless of physical location, the IT units must pay significant attention to access issues (including library resources and services, help desk services, technical support, training programs, computer labs, and electronic classrooms). Because the original Fairfax campus is the largest and most established of the three campuses, the challenge for the IT units, is to guard against peripheralization of the other two campuses. By ensuring that all campuses receive equitable services, the IT units are instrumental in achieving the overall mission and goals of a distributed university.

The balancing act of unified IT services involves both managing growth and realistically managing customer expectations. Increased budget allocations (for personnel and non-personnel needs) are quite beneficial; however, they also require strategic rethinking of organizational structures and relationships and administrative responsibilities. Combined IT resources become a more visible focus within the university community and may create unrealistic customer expectations about the IT unit's ability to solve the university's problems. As a result, the IT units need to carefully manage and communicate realistic expectations for IT support and services.

Strategies for Dealing with the Issues

The following strategies have been pursued by the IT units to respond to the needs of the distributed University campus environment:

Collaborative Staffing and Programming

1. Projects and Committees

The IT unit has developed some creative models for sharing staff including staff "loans" to another unit and jointly developed committees. University Libraries, for example, set up a joint project with DoIIIT to develop online learning modules in research skills. A librarian was assigned to work with DoIIIT instructional design staff. Similarly, a library staff member was loaned to DoIIIT to lead a project on information technology assessment in conjunction with DoIIIT's STAR (Student Technology Assistance and Resource) Center.

Furthermore, systems librarians work collaboratively with UCIS technical personnel on a variety of network support issues. And other librarians with well-developed computer skills assist UCIS with computer field troubleshooting and support, especially on the Prince William campus where currently UCIS is not adequately staffed.

The University Libraries recently underwent administrative and programmatic reorganization, placing much greater emphasis on staff involvement at all levels with planning, implementation, assessment, and continuous improvement of its programs and services. Five standing groups were formed to provide team-based leadership for key functional and service areas of the library. In several instances DoIIIT and UCIS staff members serve alongside their library colleagues offering their expertise and helping the Libraries better fulfill their mission and role within the University.

University Computing and DoIIIT share responsibility for computer lab and classroom support at the Arlington and Prince William campuses since DoIIIT has, until recently, had no permanent staff assigned to those campuses. This involved setting up regular meetings of the IT managers working on those campuses to coordinate support issues and information sharing. DoIIIT staff work at the campuses when necessary to install and upgrade equipment. DoIIIT and UCIS also coordinate the training of student lab assistants so that the lab assistants on all campuses have similar training and performance expectations.

Another prime example of IT staff sharing and collaboration is Mason Web--George Mason's University-wide Web site. This project originally started out a library initiative and as the usefulness of this technology became apparent for all other parts of the institution, it was decided that there needed to be University-wide oversight of the project. The Vice President for Information Technology appointed a coordinating committee with representatives from academic and administrative units of the University. A librarian chairs the committee, with DoIIIT and UCIS staff also fulfilling leadership roles on the committee. A systems librarian serves as a technical support person, along with several UCIS staff.

2. IT Training Group

One of the most extensive collaborative efforts of the new IT unit is a joint Information Technology Training Group. In the past, a number of different units offered various kinds of technology-related training sessions and workshops. University Computing ran a regular series of application training sessions for office productivity tools. University Libraries set up sessions on the use of databases and Internet search strategies. The faculty development office offered classes for faculty in creating Web pages and the student technology support groups offered classes for students in multimedia applications.

The IT Training Group, coordinated by DoIIIT, includes representatives from University Computing, University Libraries, the Instructional Resource Center, and the Student Technology Assistance and Resource Center. In its first year, this group worked on coordinated scheduling of training events so that similar events wouldn't compete with each other. It also agreed on a specific division of responsibility so that two groups wouldn't offer the same kinds of classes. For example, the DoIIIT units agreed to offer PowerPoint training since they had the best staff resources for this, while University Computing covered the other standard office applications. University Libraries, on the other hand, concentrates its instructional programs on aspects of content, retrieval, and evaluation and use of information.

Besides working out these kind of operational kinks, the group also began to assess the type of training being offered at the University and developed some new models. They created a very successful program called BYTE Week (Build Your Technology Expertise) in which they combined their efforts to offer a weeklong series of classes in a wide variety of information technology applications. After its first iteration, BYTE Week was expanded even further to include collaboration with other University offices to offer dozens of sessions in both technology-related and non-technology-related instructional support. (For a look at this program, visit BYTE's Web site at http://www.doiiit.gmu.edu/byte/.)

The IT Training Group is currently working on a coordinated Training Web page for the University so that students, faculty, and staff will have one place to look for all IT-related training options.

3. Support for Statistical Software

The IT units were also able to address collaboratively the question of support for statistical software. DoIIIT and the UCIS Support Center got many requests for help with statistical applications such as SPSS and SAS, but because the requests frequently involved not just software expertise but statistical expertise, it was hard to provide a consistent source of support. Neither DoIIIT nor UCIS had staff specifically trained in statistics with time to provide consulting on research and analysis questions.

University Libraries, however, did have a staff person with the necessary expertise, but did not have any facilities to mentor and train faculty in the software. Faculty also needed to have statistical software available in the computer labs and electronic classrooms for demonstration work and class assignments. However, there were often problems with lack of standardization--which version of the software was available in which location--and how that coordinated with the version being used in the exercises supplied by various textbook publishers.

When the three units sat down to see how they could address this issue together, they were able to devise a plan for tiered support service which clearly defined the contribution of each unit and allowed staff in each unit to direct faculty and students to the appropriate place to get help. The support plan is online at http://www.doiiit.gmu.edu/spss.htm. The Web site developed for statistical assistance and resources is available at http://library.gmu.edu/~srs.

In fact, the recent announcement of this centralized service triggered a positive response from three academic units in the University providing specialized statistical research support (e.g., survey research, analysis of data sets) which is now leading to an even larger collaboration and leveraging of resources among academic units and the IT units.

Collaborative Planning and Assessment

1. Departmental Liaisons

University Libraries has long had in place a system of departmental liaisons to assist faculty and students in the academic units to make the most effective use of the library's instructional and research resources, and to have a point of contact for library services in general. This program has been highly successful and is serving the needs of both the academic departments and the libraries. This service model is also very appropriate given the increasing "digitalization" of the library's resources and services. It permits librarians to spent time and interact with faculty and students away from the library where many nowadays are increasingly doing their research by accessing library services and resources remotely.

University Computing started in the last year to assign field service technicians to particular customer areas, both academic and administrative and to establish liaisons within UCIS to each academic area. Some field service technicians were physically based in several academic areas, yet organizationally reporting centrally to the UCIS department. The remaining support areas were established using a zone methodology to ensure that technical staff gained understanding and visibility among a smaller area of customers. At an administrative/strategic level, UCIS also created a Director liaison program where each technical director was assigned one or two main academic units to interface with to ensure effective communications and joint planning.

This fall DoIIIT also initiated a departmental liaison project. However, since DoIIIT has a much smaller staff than either of the other main IT units, it was not possible to duplicate the level of service provided by the libraries or by UCIS. Therefore, DoIIIT's liaisons were instructed that their first responsibility was to make connections with the staff (i.e. the Library liaisons, UCIS field service technicians, departmental tech support staff) already serving each academic unit in order to be aware of what was already being provided and to make sure that the other support personnel were aware of what DoIIIT could provide to faculty and staff in the academic units. By making these connections, the IT units hope to enhance rather than duplicate services and leverage existing resources to the greatest degree possible.

2. Facilities Planning

One of the best ways to ensure effective support in a distributed campus is to involve the support units in planning new facilities from the beginning of the project. At George Mason, the IT units are currently part of the planning teams for new building projects at all three campuses. This means that professional IT staff have input into the design and configuration of classrooms, lecture halls, and support spaces along with the Facilities staff and the academic directors. This ensures not only that the IT infrastructure (wire closets, raceways, risers, etc.) is appropriate to the function of the building but that the building includes space for the appropriate support staff and facilities in the appropriate locations. (For example, the technology repair area is near the service entrance and not in the middle of a block of classrooms.) It also avoids frustrating experiences like retrofitting a brand-new facility because no one thought about the sight lines for the new projector system or finding out that the new workstations aren't big enough to accommodate computers and student books and papers.

3. Service Level Agreements

Historically, departmental support for both faculty and staff was provided based on established expectations. Moving to improve overall service levels, the University Computing and Information Systems (UCIS) department established Service Level Agreements (SLAs) with major academic units (like the College of Arts and Sciences and the School of Information Technology & Engineering) and some administrative departments. As well SLAs were established even within UCIS between different departments – such as between the UCIS Support Center (Help Desk) and the Local Area Network (LAN) department. These SLAs create a clear and definable baseline for service levels and ensure that services of the central IT unit know what to expect from UCIS, when to expect it, and what remedial actions should be taken should these service levels not be met. Development of SLAs also improves overall communications with customers of UCIS and creates important avenues for continued dialogue to greatly enhance overall service levels.

The tiered support for statistics, described above, was based in part on UCIS's model of the service-level agreement.

4. Technology Standardization

Over the past 9 years, George Mason University has slowly worked to implement technical and functional IT standards across all levels of the institution. UCIS has standardized on Nortel/Bay Networks data/voice/ATM infrastructure topology, Nortel telephony, Octel voice mail, DELL/Gateway PCs, and HP printers. As well, the institution has selected a common campus-wide e-mail messaging/collaborative application (Netscape Communicator), a common desktop productivity application (Microsoft Office), and selected and implemented a suite of common transport protocols. This level of standardization really helps with troubleshooting IT difficulties (limited finger pointing), customer usage training, Support Center (help desk) support, ease of migration/upgrade, installation/implementation of new technology, and effective site license contract negotiation. This initiative was implemented with direct input from the Mason customers (faculty, staff, and students).

Conversion and migration strategies to new standards came slowly since much of the install-base was in good working order when we initiated this effort. Mason worked out a plan to implement replacement strategies, to the new standards (when plausible), as equipment and application software became dated. All standards are now in place on centrally/UCIS maintained systems and networking.

Multiple levels of support are provided to all departments and students who use these centrally maintained systems and applications. Customers are allowed to purchase and install any desktop non-supported software and hardware in their offices/departments, but must support it themselves. Overall, the implementation of standards has been very successful and has succeeded in reducing overall service time-to-repair and IT support staff effectiveness and efficiency.

Following the same line of reasoning, DoIIIT has also used this strategy in defining which instructional software will be supported. WebCT, for example, has been implemented for course management, allowing DoIIIT to train its own staff and provide extensive support to students and faculty using the system.

Collaborative Budgeting

While each IT unit has its own independent operating budget, the IT unit submits one coordinated budget request for all IT initiatives and senior managers frequently discuss budget strategies.

This year, the IT group has adopted a new strategy in order to help manage expectations: tying budget requests directly to priorities set by the academic and administrative unit heads. The Vice-President for Information Technology asks these administrators for their priorities and needs in information technology and makes budget requests based on the input received. This year, for example, the deans of the schools and colleges and directors of the institutes gave a very high priority to implementing enterprise-wide email and collaborative tools and improving network services. These items, therefore, have been given a prominent place in the IT unit's budget request for next fiscal year so that it will be clear that IT money is being spent on the projects to which our clients have given a high priority.

In individual unit budgets, the directors also take pains to identify specifically funds allocated for specific priorities and projects. In DoIIIT's case, this means separating out all expenses related to the Technology Across the Curriculum program since this is an item for which the unit receives designated funding. The department wants to be able to demonstrate how the money is being spent and not just let it be buried in a large general budget picture.

In the case of the University Libraries, recent efforts to increase funding have been successful because of the pursuit of a differentiated, dual strategy: fashioning budget justifications on the basis of (a) academic program expansion, and (b) response to growth of existing programs. The establishment of adequately staffed and funded libraries in the distributed campuses (Arlington and Prince William) constituted an example of the former strategy. The development of these two new libraries was made possible through additional categorical funding, rather than cannibalization of the existing library budget. Similarly, as the University's existing academic programs have grown in students and faculty, the Libraries' budget is being augmented to address staffing and collections/information access needs.

Conclusion

In our first year of working together in a coordinated IT-wide organization, the senior IT administrators have developed a good working relationship and have begun to put in place collaborative planning and programming strategies that allow us to provide the best possible support for our distributed University environment. The kind of collaborations we discussed above enable the three main administrative units to act inter-dependently in areas where the needs, perspectives and expertise of the other units facilitate development of better programs and more effective coordination of services. This in turn, over time, fosters cultural organizational changes in each of the units. By bringing together librarians, computer and networking personnel, and instructional designers and technologists, we are better able to respond to the University's "continuum" of information technology needs for teaching, learning, research, and outreach endeavors. In our particular institutional setting, this driven-from-above collaborative approach is a somewhat new experience, certainly a different way of doing business, for staff in our respective units. Early indications point not only towards staff acceptance, but towards an eagerness and willingness on their part to work with colleagues from other IT units to solve shared IT-related problems. We're looking forward to what the second and future years have to bring.

EDUCAUSE *Information Resources Library*

Transforming Education Through Information Technologies

Abstract

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ID Number: EDU9910

Title: Deconstructing Classroom Technology in Practice: What Our Web Instructional Techniques Suggest about What Faculty Want

Author: John F. Chizmar, David B. Williams

Organization: Illinois State University

Year: 1999

Abstract: This presentation deconstructs Web-based techniques that the presenters have researched and developed over several years, and demonstrates how each component can be used as a model for specific strategies in the classroom and services and products that faculty can use and apply. A variety of Internet and Web technologies are shown as they apply to the teaching of a statistics course and a fine arts course, both classes using a project-based or constructionist teaching strategy. Our unique coupling of the arts and statistics reveals how the same basic approach can be used in seemingly disparate settings to achieve instructional goals that are supported by many years of pedagogical research. Various technologies are used to stimulate students to create authentic finished work, publish their work on the Web, and develop real-world problem-solving skills. This paper discusses technologies and teaching strategies that reveal the characteristics of instructional technology services and products that faculty want.

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Deconstructing classroom technology in practice:
What our web instructional techniques suggest about what faculty want.

by

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ABSTRACT: This presentation deconstructs web-based techniques that the presenters have researched and developed over several years, and demonstrates how each component can be used as a model for specific strategies in the classroom and services and products that faculty can use and apply. A variety of Internet and Web technologies are shown as they apply to the teaching of a statistics course and a fine arts course, both classes using a project-based or constructionist teaching strategy. Our unique coupling of the arts and statistics reveals how the same basic approach can be used in seemingly disparate settings to achieve instructional goals that are supported by many years of pedagogical research. Various technologies are used to stimulate students to create authentic finished work, publish their work on the Web, and develop real-world problem-solving skills. Technologies and teaching strategies used will be discussed and deconstructed to reveal the characteristics of instructional technology services and products that faculty want.

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INTRODUCTION

We have been researching, developing, and refining a set of web-based technologies for the teaching of statistics and fine arts courses over the last four years. We offer these courses to our students both on-campus and over the Internet. The particular teaching strategy we employ in both our fine arts and economics courses is project-oriented or constructionist in design.[1] Students like to feel that they are doing something practical, that builds real-world problem solving skills, and that results in a portfolio of authentic finished work. We use Internet and Web technologies to stimulate students to create authentic finished work, publish their work on the Web, and develop research techniques for finding data on the Internet that can be applied to real-world problem solving. Our approach uses these technologies to involve students actively in their own learning and to help prepare our students for the world of work.

Today's session extends our previous work. For CAUSE97, we explored issues of best teaching practice, administrative hurdles, and old-fashioned politics attendant to Internet delivery of instruction (Chizmar and Williams, 1997). For CAUSE95, we examined altering time and place in learning environments using network technologies (Chizmar and Williams, 1995, 1996). Today we will focus on the classroom activities and student projects, and the specific technologies used that rely heavily on the Internet for delivery, collaboration, and communication. Our unique coupling of the arts and economics shows how the same basic approach can be used in seemingly disparate settings to achieve improved instruction, and how this approach can be *deconstructed* to reveal the characteristics of instructional technology services and products that faculty members want and can successfully use in the classroom. We will offer the following "deconstructions" of faculty "wants." We present this list not only on the basis of our own research and practice, but from preliminary results of a recent survey that we conducted on our campus:

1. Faculty want instructional technology that is driven by pedagogical goals. Faculty want to use technology effectively to reach new audiences or to reach traditional audiences in new ways.
2. Faculty desire Web-based tools that are designed for a specific pedagogical task as opposed to a "Swiss-Army knife" Web-tool that is designed for many tasks. Faculty want to be able to turn to technical experts when they need help in developing a Web-based application that would require technical expertise that it beyond what should be expected based on the traditional cost/benefit ratio of faculty time.
3. Faculty desire to interact and compare notes with peers on campus who are involved in instructional technology at a comparable level.
4. Faculty desire technical support and network services that are reliable and fast enough to run sophisticated applications efficiently without frustrating students and faculty.
5. Faculty desire some recognition, both monetary and non-monetary, for developing and using instructional technology in their classrooms.

PEDAGOGICAL ISSUES

While our disciplines are as different as night is to day (dismal scientist meets starving artist), fundamentally many facets of our active learning solutions are similar. We believe this wonderful serendipity is the result of sharing fundamental instructional goals (and too many Chinese lunch buffets). We both strive to:

- provide forums to encourage student-to-student and student-to-faculty contact,
- give frequent evaluations,
- provide prompt feedback,
- challenge students with significant real-life problems,
- provide opportunities for students to publish their work and build an electronic portfolio of work,
- expect frequent, significant authentic products,
- articulate clear criteria for evaluating finished products, and
- provide opportunities for students to revise their work.

We firmly believe that pedagogy drives technology. Table 1 provides an inventory of the various technology applications we employ in our courses, all of them Web and/or Internet based. In the far left column you can see how these techniques map to the applications that we needed in order to achieve the learning goals above.

This table further illustrates that we not only use a rich array of technology tools to meet these goals, we also use a variety of teaching strategies as well. We carefully choose technology that enables us to *present* multimedia-

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rich information to our students and to create any-time/any-place student-to-student and student-to-faculty *interactions*. Most importantly, we choose technology to provide flexible *guides* for students to explore and create multimedia rich environments to enhance learning. We will refer back to the tools, strategies, and concepts in this table throughout our discussion.

STATISTICS AND ECONOMETRICS COURSES

Chizmar teaches undergraduate statistics and econometrics courses. The statistics course is designed to emulate the premise of an unconventional, NSF-funded statistics course called "Chance" (Snell and Finn, 1992). It enables students to learn statistical reasoning by studying important current economic controversies whose understanding requires a fundamental knowledge of statistical reasoning. Figure 1 shows a screen-shot of the statistics course homepage.

The statistics course employs a collaborative classroom/laboratory approach as its active learning pedagogy. The expository material is broken into a series of "labs"; each lab has its own Web-page linked to the on-line syllabus. The labs guide students to discover important statistical concepts on their own and challenge students to demonstrate their understanding of statistical issues by posting explanations and interpretations in NetForum and by completing a series of Mallard mastery homework quizzes.

NetForum is a web-based threaded discussion that is used in the statistic course to encourage student-to-student and student-to-faculty contact. Mallard is an ingenious Web-based system for asynchronous, interactive learning. Mallard is used in the statistics course to enable a mastery homework system. Homework exercises are created in Mallard using a combination of HTML tags and syntax idiosyncratic to Mallard. Mallard can not only immediately assess the correctness of a response to an online exercise, but it can also be programmed to help a student determine why an answer is incorrect. Since exercises are submitted and graded online, the system corrects, and even records grades. Furthermore, the system provides the instructor with detailed student grade information, e.g., the number of times a student retakes a homework assignment.

Mallard can be programmed to randomly generate and select questions. As a result, students can complete a different set of questions over the same concepts each time that they choose to retake the same homework assignment. Mallard also includes a gradebook module that gives course instructors complete control over grading policies, including late penalties and the number of times a Mallard exercise can be taken for credit. The combined features of Mallard can be used to create a mastery homework system. Figure 2 shows a screen-shot of a representative Mallard home-work quiz.

The econometrics course is designed for students to learn how to conduct econometric research by replicating published research. Based on the premise that students like to see their names in print, Chizmar uses Web technologies and the lure of publishing on the Web to stimulate students to create authentic finished work. From a list of several published articles that use data from the National Longitudinal Survey of Youth (NLSY)[2], students choose an article to replicate. Following a set of Web instruction pages, the student's first task is to extract (using the NLSY CD-ROM) a data file that replicates as closely as possible the data used in the chosen article and to import the data into the statistical software program, MiniTab.

Over the course of the semester, students write four drafts of their paper. Each draft is accompanied by its own rubric. Each rubric states, in advance, the explicit econometric issues that a student must address to earn the grade he/she desires. Figure 3 shows a screen-shot of a rubric for Economics 238.

The students publish their papers on the Web using a student-papers-publishing system created using Tango software to access the database. Students post their paper to the Web by completing a Web-form. The form automatically creates a link to the student's paper on the Student Paper page. In addition, a second link is created that invites anyone to "Click here to Post a Review" of a paper. This link brings up the appropriate rubric for the student's paper. Because the rubric is on the Web, anyone can use it to post a review. However, as a way to communicate high expectations, Chizmar requires his students to post a review of the third draft of a classmate's paper. Various on-line resources for the statistics and econometrics courses can be viewed on the Web at the following sites:[3]

- Course Home Page http://www.econ.ilstu.edu/Jack_Chizmar/ECO138/ECO138_Home.html
- A Representative Tutorial http://www.econ.ilstu.edu/Jack_Chizmar/Chizzie/scatterplot/Tut8_plot_win.html
- A Representative Lab http://www.econ.ilstu.edu/Jack_Chizmar/Int_Tech/Lab6a/Lab6a_win.html
- Mallard Mastery Homework Quizzes https://mallard.ilstu.edu/eco131/
- Student Paper Publishing System http://coyote.its.ilstu.edu/tango/chizmar/list.qry

FINE ARTS MULTIMEDIA COURSES

Williams teaches a two-semester course, Software Design in the Arts I and II. The course focuses on the development and design of multimedia and web applications for fine arts student. It is offered both on-campus and on-line over the Internet. Figure 4 shows a screen-shot of the class homepage for Music, Art, and Theatre 350.

The course is designed to be project oriented. Along with each project to be completed, students must also master a multimedia literacy quiz and a hands-on skills exam with items appropriate to any given project. Class times are spent with lecture/demonstration on techniques needed to complete the projects or on supervised work and question-and-answer time with students. At the end of each project, students present their work to the class (including the on-line students) followed by an open class critique of the project.

The on-line students are connected over the Internet and contemporaneously participate with the instructor and on-campus students attending class in a computer teaching lab. The lab is customized for distance learning with:

- remote controlled cameras for broadcasting views of students, the instructor, or the white boards;
- a choice of broadcasting the computer, document camera, VCR, or slide video;
- wireless microphones for the instructors and button-activated microphones at each student workstation;
- and video monitors to view the video signal being sent to the RealVideo server for broadcast.

All of these features are controlled from a touch-pad display panel on the teaching station.

On-line course materials. The course materials and the delivery method for the two-semester course are designed so that both the on-campus as well as the on-line students participates in the same class and class activities. A course web site (See Figure 4) serves as the focal point for all class activities and resources: syllabus, grading and evaluation, guidesheets and visuals for all projects, software and project templates available for downloading, links to on-line resources available elsewhere over the web, and the like. The course uses a special sets of on-line guides and tutorials designed by the instructor. The materials guide the student through the design of multimedia projects (PowerPoint, Authorware, Director, and Web pages) using a variety of models from art, music, and theatre activities from which they can construct their own productions that have direct application to professional experiences. The guides provide templates, demonstration models, links to resources and software tools, and a list of clearly prescribed skills and concepts to be mastered. Parallel to each guide are a set of web-based, hands-on activities related to specific software and digital arts skills required to successful complete the project. Students must demonstrate mastery on prescribed hands-on skills for each unit.

Two features of the Mallard web-based software package are used, similar to Chizmar's statistics classes. First, the quiz generation software is used to create practice and final versions of multimedia literacy quizzes, one for each unit of the course. These test are objective in nature but take advantage of the complex variety of test items which Mallard offers that are beyond fill-in-the-blank and multiple-choice designs. Fairly complex matching, lists, multiple-item selection, and multiple-part item construction with graphic and audio examples are used. The quizzes are immediately graded with feedback when the student submits the exam. Students are permitted practice sessions before the final exam versions, the one on which they are graded. Second, Mallard's online gradebook permits personal, password access for students to monitor their progress over the course of the semester. All activities can be entered into the gradebook, not just Mallard quizzes.

For student-to-student and instructor-to-student interaction, NetForum provides a threaded and archived discussion group on the class web site with electronic dialogue possible on any topics that the instructor or the students propose. NetForum also provides a handy group-email feature that makes it easy to send email to any set of class members.

Interaction and delivery with on-line students. Each class session is broadcast to the on-line students over the Internet using RealVideo. The broadcasts are then archived to the class web page after each session. The archives give students the option of either reviewing portions of the class from the recording, or, for students who could not attend class during the scheduled time, the opportunity to audition the complete class session at a later time. Figure 5 shows a screen-shot of the Web archive of RealVideo lectures for the fine arts course.

All key class material is placed on the course web site, and the instructor makes every attempt to keep the web materials, visuals, and the software used in class synchronized aurally during the Internet broadcast. In a sense, the on-line students become virtual students at their home site, following along with the class activities on campus. The instructor's role is akin to a play-by-play announcer for a baseball game, verbally describing activities to keep the on-line students involved in the class. The system works very well and on-line and on-campus students soon begin to respond to each other and even inquire when someone was absent.

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AOL Messenger (AIM) provides the means for the on-line students to communicate with the classroom and the instructor. When the on-line students submit a comment or question over AIM, the instructor then reads the email and responds aloud to the class with simultaneous broadcast over the Internet. We are currently experimenting with using NetMeeting and ICQ to provide video and audio communication between the on-line students and the classroom in place of AIM's text-chat only format. Portions of the web site, including the RealVideo lectures and special guides and tutorials, are password protected for access to registered students only. Below are a few selected web links that illustrate various features of the courses:[4]

- Software Design in the Arts I Home Page http://www.arts.ilstu.edu/classes/softdesign
- Software Design in the Arts II Home Page http://www.arts.ilstu.edu/classes/inet
- RealVideo Lectures http://www.arts.ilstu.edu/classes/inet/RA/realaudio.html
- NetForum Threaded Discussions http://www.orat.ilstu.edu/cgi-bin/netforum/i_modelssem/a/1
- Web Etudes on Musical Themes http://www.orat.ilstu.edu/classes/inet/etudes.html
- Prescreening form for Internet and web technology prior to registering for the course http://www.orat.ilstu.edu/classes/inet/documents/onlineinfo2.html
- Online student evaluation form: http://www.orat.ilstu.edu/classes/inet/documents/classeval.html

WHAT DO FACULTY WANT?

We believe that our joint approach to using instructional technology can be *deconstructed* to reveal the essential characteristics of informational technology products and services wanted by faculty. Table 1 provides a ready guide to the key technologies, teaching strategies, and applications we have successfully put into practice. While we readily admit to being card-carrying "early adopters," we nonetheless believe that our work can be fruitfully deconstructed to yield a set of needs that is representative of all faculty, even "wary adopters." The stages of development that we have experienced as we struggled to improve our instructional technology are the same stages that a devoted novice instructional technologist will eventually pass through, perhaps kicking and screaming all the while. Of course, this assertion is testable, so we decided to survey Illinois State faculty to obtain a snapshot of faculty attitudes and needs regarding the use of instructional technology in their teaching and classroom activities.[5] Our plan, in the remainder of this paper, is to confront each of our assertions or "deconstructions" concerning "what faculty want" with a combination of anecdotal data from our classroom experience and survey data from our campus faculty at large.

Deconstruction 1. Our approach is driven by pedagogical goals. Which leads to the foremost "want" of faculty:

Faculty want instructional technology that is driven by pedagogical goals.

In a previous presentation, we emphasized the importance of choosing a technology that will support a desired pedagogical strategy, not the other way around. (Chizmar and Williams 1997, 3) We emphasize again our belief that technology must not be dominant and must not be used for its own sake. As long ago as 1972, the Carnegie Commission on Higher Education (The Fourth Revolution) created the litmus test for best use of instructional technology:

- the teaching-learning task to be performed [is] essential to the course to which it is applied, and
- the task could not be performed as well—if at all—for the students without the technology.

We believe our choices of instructional technology pass this test. Our choice of Mallard, for example, is driven by the pedagogical goals of giving frequent evaluations and providing prompt feedback (Light, 1990, 31). Our choice of NetForum is driven by the goals of creating interaction between students so they help each other find solutions to problems and at the same time build a sense of a cooperative learning community that exists beyond three 50-minute class periods.

Chizmar's choice of a Tango-based, student-paper publishing system, is driven by the goal of giving students a chance to revise and improve their work over time (Light, 1990, 9) and motivating students to create authentic finished work. William's choice of web-based tutorials to guide and encourage students in building their own multimedia productions is driven by the twin goals of creating learning environments that are rich in resources and media to contemporary information, and allowing the opportunity for creating real-world, finished products that are directly applicable to future professional needs as multimedia artists.

A corollary to Deconstruction 1 is that:

Faculty want to use technology to reach new student audiences or to reach traditional student audiences in new ways.

At a time when many are questioning the efficacy of using the Web and Internet delivery of instruction—considering it a demotion of academic standards and classroom practice—we must not loose sight of the ways in which technology can open new windows of opportunity, allowing us to reach new populations and teach in new and more effective ways. We concede that a student from North Dakota who is taking one of our classes is not having the same experience as the student sitting in a classroom in Normal, Illinois. However, the important consideration is that this student, through the use of the Internet, is able to fully participate from a remote location when the only other option is not having access to a unique learning opportunity and a unique community of students.

We had one key statement on our survey related to Deconstruction 1—"for instructional technology to be effective, it must first be driven by pedagogical goals." A vast majority (88 percent) of the responding faculty either "somewhat" agreed (17 percent) or "strongly" agreed (71 percent) with this statement. (See Statement 1 of Table 2.) Interestingly, faculty who classify themselves as "advanced" or "intermediate" users of instructional technology are much more likely to agree with this statement than faculty who classify themselves as "beginners." We can understand this result, however, since a novice user is more likely to be both overwhelmed and enchanted by the technology, allowing it to dominate what normally would be common-sense pedagogical decisions.

Deconstruction 2. Our approach uses off-the-shelf or personally developed software capabilities that are designed to meet specific pedagogical tasks. Which leads to:

Faculty desire Web-based tools that are designed for a specific pedagogical task as opposed to a "Swiss-Army knife" Web-tool that is designed for many tasks.

We agree with Donovan and Macklin's (1998, 11) assertion that faculty want to "accomplish specific tasks using technologies and want to be able to easily repeat these tasks in subsequent academic quarters."[6] Our choice of Mallard was based on our need for two particular features of Mallard, not the complete package: its powerful quiz generation and management feature and its online, personal gradebook. Mallard provided within its package a tool that we could use to write sophisticated, multiple-part questions at higher-order cognitive levels and publish them for our students on the Web (a feature that led to our selecting Mallard over WebCT, for example). At the same time, we did not want to be burdened by features within the chosen Web-tool that we knew we would not use because we had already found an alternative (usually better) way to accomplish a given pedagogical task, e.g., generating Web-based threaded discussion and feedback through NetForum.

Chizmar's decision to create a student paper-publishing application was based on his need for a tool whose sole purpose was to publish student papers on the Web and to tie each paper to the appropriate instructor-generated rubric and to student-generated reviews. William's choice of using RealVideo was driven by the need for a cost-effective solution to broadcasting reasonable quality video to on-line students who would be receiving the materials over modem from a computer workstation at home. Likewise, the choice of the AIM software provided Williams with a free and widely accessible chat software that any potential student could have access to and that worked unobtrusively in the background of the instructor's and on-line student's workstation.

A corollary to Deconstruction 2 is that:

Faculty want to be able to turn to technical experts when they need help in developing a Web-based application that would require technical expertise that it beyond what should be expected based on the traditional cost/benefit ratio of faculty time.

Chizmar's decision to turn to the University's instructional technology unit for help in developing the Student Paper Publishing System was based on the knowledge that his time would be better spent on more traditional teaching and research activity than in developing Tango programming skills. The Paper Publishing System is a prime example of the kind of special software modules that can be developed for faculty to meet a specific pedagogical goal. Following the University of Washington's lead, Illinois State University's instructional technology strategic plan recently envisioned the creation of a whole series of modules that faculty could choose from to add functionality to their teaching site by simply selecting from a menu of instructional modules on a Web-form.

We had several statements on our survey related to Deconstruction 2. An overwhelming majority of respondents (83 percent) either "somewhat" agreed (38 percent) or "strongly" agreed (45 percent) with the statement, "When I seek technical help it is when I want to know how to accomplish a specific task using technology." This sentiment is shared evenly by beginning, intermediate and advanced users alike. (See Statement 2 of Table 2.) Slightly more than half (52 percent) of the respondents either "somewhat" agreed (26 percent) or "strongly" agreed (27 percent) with the statement, "I prefer to pick the one application I need to solve a specific pedagogical problem rather than having to adopt a 'Swiss-army-knife' Web tool that does everything." (See Statement 3 of Table 2.) Again, advanced users are much more likely to agree with this statement. Not surprisingly, 45 percent of beginning users had "no opinion" about this statement, with the rest evenly distributed among the remaining foils. Conversely, only 33 percent of respondents either "somewhat" agreed (19 percent) or "strongly" agreed (14 percent) with the statement, "I want one 'Web tool' that does everything (e.g., mail, chat, web pages, grades, etc.)." (See Statement 4 of Table 2.) This time, advanced users are much more likely to "strongly disagree" with this statement, with beginners having no opinion. While these statistics support Deconstruction 2, our hypothesis as to why faculty would shun *"Swiss-Army knife"* Web-tool proved incorrect. Borrowing from Donovan and Macklin (1998, 12), we included the following statement on our survey, "Most 'Web-tools' (e.g., Mallard and WebCT) simplify the task of creating online instructional materials by making assumptions about the structure and shape of courses and teaching that reduce my flexibility." Only 18 percent of faculty either "somewhat" agreed (13 percent) or "strongly" agreed (5 percent) with the statement. (See Statement 5 of Table 2.) Again, the opinion of advanced users differs markedly from intermediate and beginning users. We believe that the large number of users having no opinion results from so few respondents (only 15 percent) actually having used these applications.[7]

Deconstruction 3. Our approach is fraught with frequent technology and pedagogical problems that compel us to put our heads together and compare notes on what works and how to make it work. Which leads to:

Faculty desire to interact and compare notes with peers on campus who are involved in instructional technology at a comparable level.

Development of the Mallard gradebooks and quizzes is a good of example of where we assisted each other in problem solving the complexities of this system and shared various test item solutions. Similarly, Williams' expertise with more complex programming knowledge and multimedia techniques were traded with Chizmar's statistical, survey knowledge, and cooperative learning techniques such as the one-minute paper strategy.

Williams was involved with a campus faculty group that developed a proposal for a Faculty Technology Cooperative where faculty could come together to share experiences and barter and trade expertise with the goal of working together to improve the use of instructional technology on campus. The initiative has languished for several years for lack of central support. A recent campus strategic planning initiative recognized the value in this proposal and has brought the proposal back on the table for consideration by campus administration.

Two statements on our survey are related to Deconstruction 3. An overwhelming majority (72 percent) of the respondents either "strongly" disagreed (41 percent) or "somewhat" disagreed (31 percent) with the statement, "demonstrations of the success and failure of other faculty technology projects is a waste of time." (See Statement 6 of Table 2.) This time, beginning users were more likely to disagree with this statement than advanced user. When asked whether they "would like more faculty showcases in instructional technology that demonstrates real-world applications in the classroom," 63 percent of respondents either "somewhat" agreed (34 percent) or "strongly" agreed (29 percent) with the statement. (See Statement 7 of Table 2.) Advanced users responded bi-modally. While

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67 percent of advanced users either "somewhat" agreed (28 percent) or "strongly" agreed (39 percent) with the statement, it is also true that 22 percent of advance users "strongly" disagreed.

Deconstruction 4. The comprehensive nature of our approach requires fast and reliable technical support and network services. Which leads to:

Faculty desire technical support and network services that are reliable and fast enough to run sophisticated applications efficiently without frustrating students and faculty.

Nothing frustrates students, especially technophobes, more than instructional technology that does not work. When a server is down, email is not accessible, or the help desk provides an inappropriate answer, they blame the faculty member who required them to use the software or Internet service, not the server or help desk administrators whose job is to keep it running. Nothing frustrates faculty more than to prepare to give a Mallard quiz, for example, and discover that the server is down, or that the server performance has crawled to a snail's pace because several others classes are using the server for an examination at the same time.

When catastrophes such as these occur, trust is lost between student and instructor, and confidence in instructional technology declines. Faculty desire a network and technical infrastructure that never calls attention to itself, one that does not create barriers to entry for wary faculty and students because it is too complex. The infrastructure should be transparent, much as the utility infrastructure that powers our lights and our computers – throw the switch and it works!

Two statements on our survey are related to Deconstruction 4. A majority (58 percent) of the faculty either "somewhat" agreed (34 percent) or "strongly" agreed (24 percent) with the statement, "I would use more instructional technology in my classes if I felt that there was sufficient support on campus to help me with the implementation." (See Statement 8 of Table 2.) Beginning users were more likely to agree with this statement than advanced user. Once again, advanced users responded bi-modally with 28 percent "strongly" disagreeing and 49 percent either "somewhat" or "strongly" agreeing with the statement. A larger majority of respondents (64 percent) either "somewhat" agreed (38 percent) or "strongly" agreed (26 percent) with the statement, "The difficulties of knowing where and from whom to seek help on campus create a barrier to the adoption of instructional technology." (See Statement 9 of Table 2.) Beginning users (76 percent) are more likely to hold this opinion then intermediate users (61 percent) and advanced users (61 percent.) The bi-modal response on this set of survey items can easily be explained by the very different needs of faculty who are novices with this type of technology, and those who are more advanced. The novices are in great need of lots of support, models to emulate, and are not sure where to turn for help.

Deconstruction 5. Our efforts at developing innovative instructional technology over several years have consumed enormous amounts of time and effort on our part. The few rewards we have received have been greatly valued whether they be intrinsic or extrinsic. Which leads to:

Faculty desire recognition, both monetary and non-monetary, for developing and using instructional technology in their classrooms.

We have both received a number of Internet teaching grants from our campus that provided some funding to compensate for the extra development time and for software purchases. However, we discovered early on that one can easily underestimate the time it takes to transfer teaching materials and techniques to new technology delivery systems. In addition, the present faculty evaluation system gives little recognition for instructional innovation when decisions of promotion and salary are considered. While we have received support, the rewards we received are not proportionate to the final products we produced.

As pioneers of Internet teaching on our campus, we were left to support ourselves as we struggled with issues of content, pedagogy, and delivery. Such is the fate of early adopters. We believe that late adopters will not be as imprudent. They will require monetary and non-monetary rewards in order to consider adopting instructional technology. In an earlier CAUSE presentation (Chizmar and Williams, 1997, 10), we stated, "The risk of not having such a reward system in place, is few faculty willing to commit the time needed to offer … courses [that incorporate instructional technology.]" This is especially true when one considers the movement on many campuses for faculty to instantly adopt their courses to Internet delivery, a process that requires facing the technology challenges of many of the techniques we have implemented over a period of four to five years.

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Several statements on our survey relate to Deconstruction 5. A majority (58 percent) of the faculty either "somewhat" agreed (34 percent) or "strongly" agreed (24 percent) with the statement, "The greatest impediment to my seeking training in instructional technology is the lack of release time." (See Statement 10 of Table 2.) Likewise, a majority of respondents (57 percent) either "somewhat" agreed (33 percent) or "strongly" agreed (24 percent) with the statement, "Some tangible rewards and incentives for spending time developing classroom technology would do more to motivate me than more training." (See Statement 11 of Table 2.) About the same majority of respondents (54 percent) either "somewhat" agreed (37 percent) or "strongly" agreed (17 percent) with the statement, "The lack of campus grant funds to support the development of instructional technology is a major deterrent to its adoption." (See Statement 12 of Table 2.) Advanced users were more likely to agree (62 percent.) A priori, we surmised that most respondents would agree with statements 11 and 12. Consequently, we are surprised both by the smallness of the agreeing groups in Statements 11 and 12 and the largeness of the dissenter group in Statement 11. Perhaps the real impediment to developing instructional technology is revealed in Statement 13 of Table 2, which shows that 84 percent of faculty "somewhat" agree or "strongly" agree with the statement, "the lack of time is the most critical barrier to my experimenting with technology." Faculty, like everyone else in the information age, simply have too much to do.

CONCLUSIONS AND REFLECTIONS

In conclusion, we offer five recommendations tied to each of our technology *deconstructions*.

Solution 1. Universities should create and provide a "shopping mall" of Web-based instructional technology modules, each driven by and tied to a specific pedagogical strategy. More specifically, modules addressing the strategies listed in Table 1—presenting, interacting, guiding, and exploring—should be created so that faculty members have a diverse smorgasbord of options to fit both student and instructor needs, and can configure each module to their class Web site by simply completing a on-line form. Related to the corollary to *Deconstruction 1*, campuses should provide the technology needed for Internet delivery of courses to a world-wide audience, not as an end in itself, but as a way to deliver unique course offerings that are congruent with the mission of the university and suited to Web-based delivery. Look for those unique opportunities and talents on your campus that can be delivered to a new audience using Web-based technologies.

Solution 2. Instructional technology units should invest their efforts in discrete solutions that are mapped to instructional needs and strategies, similar to those illustrated in Table 1. Swiss-Army-knife solutions like WebCT and Mallard are useful to faculty, not as comprehensive packages, but for their separate parts. Indeed, in lieu of a specific solution, faculty members choose the Web-tool that accomplishes the specific task at hand the best with the least investment in their time. If it meets an instructional technology need, faculty will use anything they can get their hands on, even if it is a Swiss-Army knife. (Every kid knows how hard it is to open some of the blades in a Swiss-Army knife. Neither of us ever succeeded in using the fork because it was too hard to open!)

Solution 3. In ways that respect the value of faculty time, campuses need to create venues for faculty to come together to share experiences, development efforts, etc. The Faculty Coop idea mentioned earlier could serve as a model to promote the bartering and sharing of faculty expertise for both content and technology.

Solution 4. Administrators who are charged with providing instructional technology leadership must always guard against allowing technology to become dominant. To ensure that technology works flawlessly, it is sometimes better to pass on the latest change or upgrade. To ensure that a technology change doesn't disrupt instruction, it is sometimes better to wait on a software upgrade or change until instructors can make the necessary adjustments to their instructional materials. Further, when technology administrators decide to adopt a new technology, they should over, not under estimate its capacity. If they decide that current budgets can not support a generous level of capacity, then they should wait until the necessary funds become available or consider outsourcing.

Solution 5. More than any time in the past, faculty need to be rewarded for their instructional development efforts through release time, monetary awards, software and hardware support, and credit in the salary, promotion, and tenure process. Just as corporate America needs research and development funding to improve productivity and profitability, so must academic America invest in instructional technology to improve productivity and credibility.

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ENDNOTES

1. "Constructionist" comes from the Russian "Con Truct Ivist," which means performing a con job on a Russian truck driver. On a more serious note, a "constructionist" approach is one in which classes are project oriented where students learn by building or constructing things.

2. Chizmar chose published articles that use data from the NLSY for two reasons. First, the NLSY data is inherently interesting to students because it concerns the problems and issues facing young people as they move into the world of work. Second, many of the research papers that use data from the NLSY use a human capital framework, which, because it is not overly mathematical, is accessible to undergraduate students.

3. All of the links to course web sites shown in this paper are "living documents" and are constantly undergoing change as we develop them for our courses.

4. If you encounter a password protected area on Williams's web sites, send an email to dwilliam@ilstu.edu and request a temporary password for access.

5. We conducted the survey using a Web form. We asked faculty to complete the form by sending an email to four different listservs on our campus. Effectively, this approach means that we reached faculty with enough interest in and experience with instructional technology to request membership is a listserv, precisely the group we were shooting for. We received 105 responses, a response rate we believe approaches 40 percent of the relevant faculty group. For the complete results of the survey, see Chizmar and Williams, 1999.

6. We also agree with Donovan and Macklin's (1998, 8) assertion that "the Web itself, not any one piece of software, [is] the 'killer app'." Donovan and Macklin offer six reasons in support of their assertion. We add that because Swiss-Army knife Web-tools are designed to accomplish many pedagogical tasks, they must make assumptions about the teaching-learning process, assumptions that many faculty members will oppose.

7. In fact, 63 percent of respondents who have used these applications either "somewhat" agreed (13 percent) or "strongly" agreed (50 percent) with the statement, "I prefer to pick the one application I need to solve a specific pedagogical problem rather than having to adopt a 'Swiss-army-knife' Web tool that does everything."

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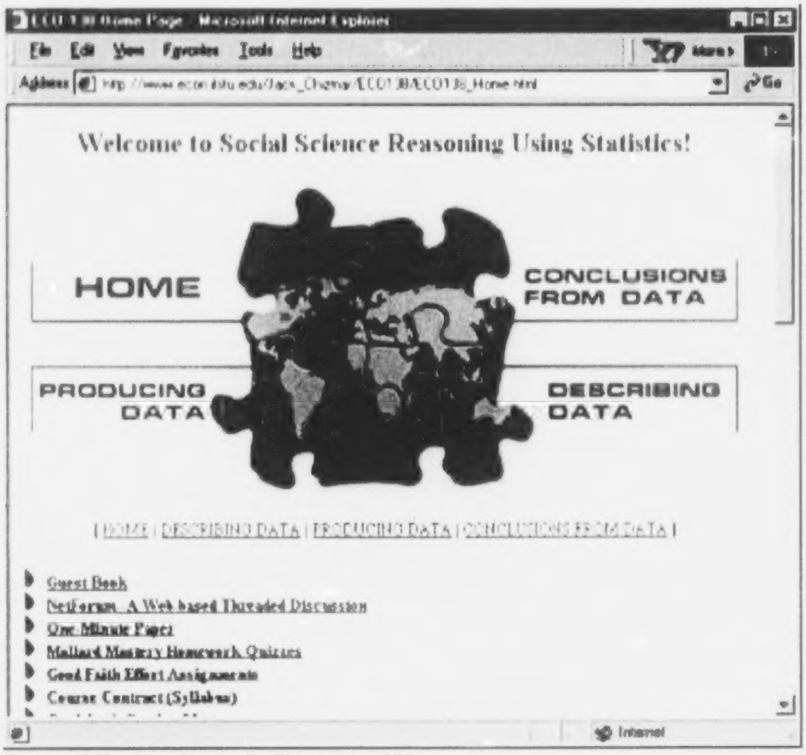
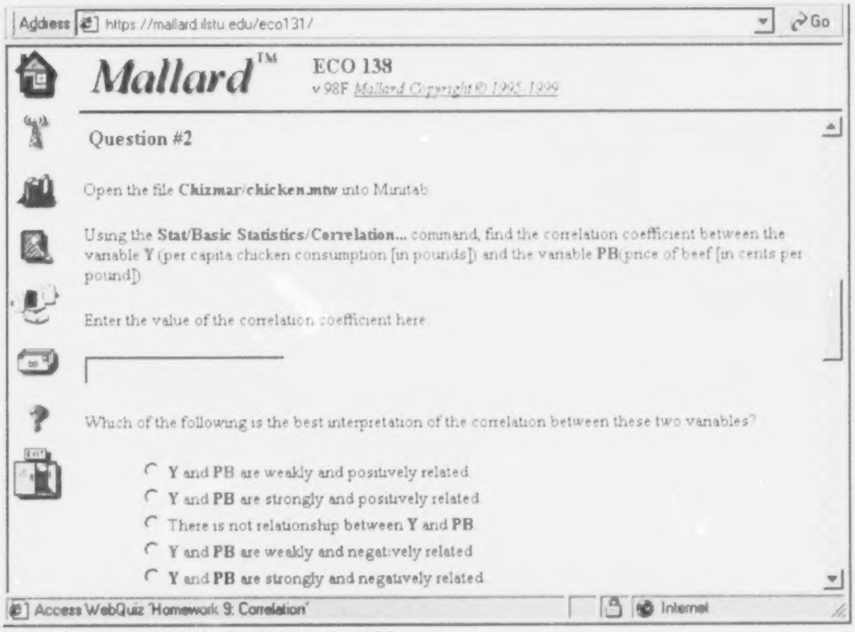

ECO 138 Home Page - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Address http://www.econ.ilstu.edu/Jack_Chizmar/ECO138/ECO138_Home.html
Go
HOME
CONCLUSIONS FROM DATA
PRODUCING DATA
DESCRIBING DATA
Internet

Welcome to Social Science Reasoning Using Statistics!

| HOME | DESCRIBING DATA | PRODUCING DATA | CONCLUSIONS FROM DATA |

- Guest Book
- NetForum, A Web based Threaded Discussion
- One Minute Paper
- Mallard Mastery Homework Quizzes
- Good Faith Effort Assignments
- Course Contract (Syllabus)

Figure 1. Class homepage for Economics 138


Address https://mallard.ilstu.edu/eco131/
Go
Mallard™
ECO 138
v 98F Mallard Copyright © 1995-1999
Access WebQuiz 'Homework 9: Correlation'
Internet

Question #2

Open the file **Chizmar/chicken.mtw** into Minitab

Using the **Stat/Basic Statistics/Correlation...** command, find the correlation coefficient between the variable **Y** (per capita chicken consumption [in pounds]) and the variable **PB**(price of beef [in cents per pound])

Enter the value of the correlation coefficient here

Which of the following is the best interpretation of the correlation between these two variables?

○ Y and PB are weakly and positively related
○ Y and PB are strongly and positively related
○ There is not relationship between Y and PB
○ Y and PB are weakly and negatively related
○ Y and PB are strongly and negatively related

Figure 2: Mallard Quiz for Economics 138

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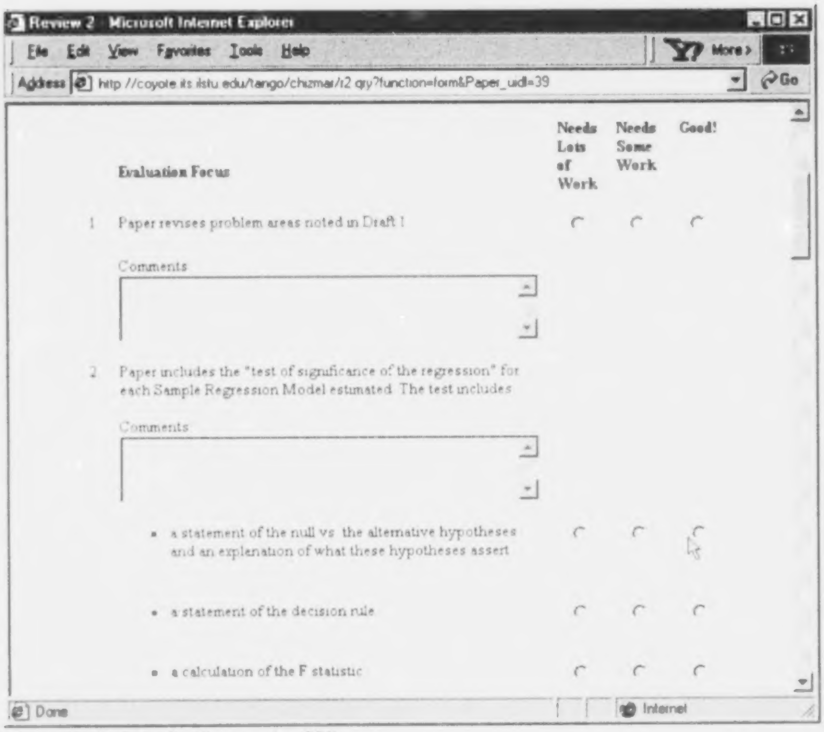
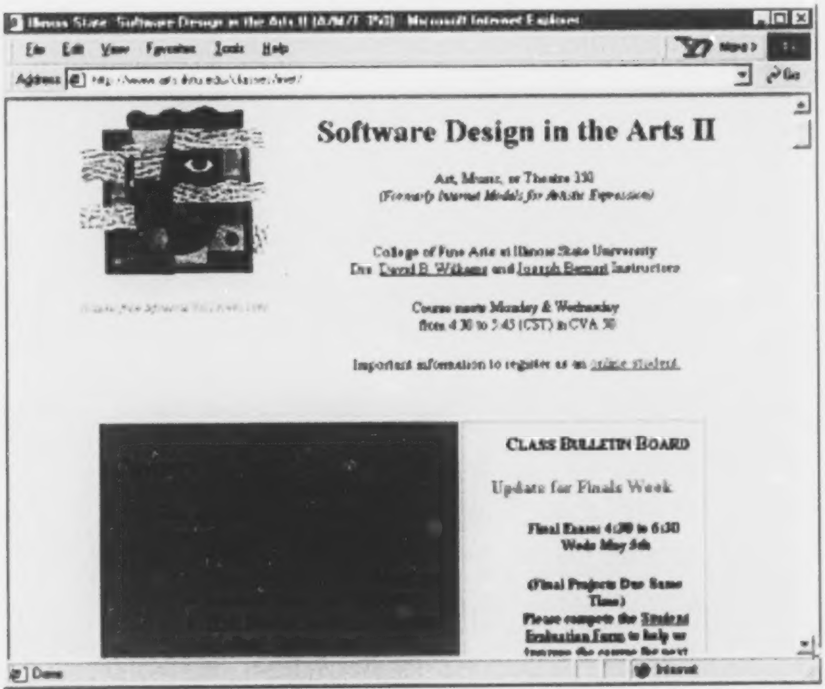

Review 2 - Microsoft Internet Explorer
File Edit View Favorites Tools Help
More >
Address
http://coyote.its.ilstu.edu/tango/chizmar/r2.qry?function=form&Paper_uid=39
Go
Done
Internet

Evaluation Focus	Needs Lots of Work	Needs Some Work	Good!
1 Paper revises problem areas noted in Draft 1	○	○	○
Comments			
2 Paper includes the "test of significance of the regression" for each Sample Regression Model estimated. The test includes			
Comments			
- a statement of the null vs. the alternative hypotheses and an explenation of what these hypotheses assert	○	○	○
- a statement of the decision rule	○	○	○
- a calculation of the F statistic	○	○	○

Figure 3. Rubric for Economics 238


Illinois State: Software Design in the Arts II (A/M/T 350) - Microsoft Internet Explorer
File Edit View Favorites Tools Help
More >
Address
Go
Done
Internet

Software Design in the Arts II

Art, Music, or Theatre 350
(Formerly Internet Models for Artistic Expression)

College of Fine Arts at Illinois State University
Drs. David B. Williams and Joseph Bernart Instructors

Course meets Monday & Wednesday
from 4:30 to 5:45 (CST) in CVA 50

Important information to register as an online student.

CLASS BULLETIN BOARD

Update for Finals Week

Final Exam: 4:30 to 6:30
Weds May 5th

(Final Projects Due Same Time)
Please compete the Student Evaluation Form to help us improve the course for next

Figure 4. Class homepage for Music, Art, and Theatre 350, Software Design in the Arts I

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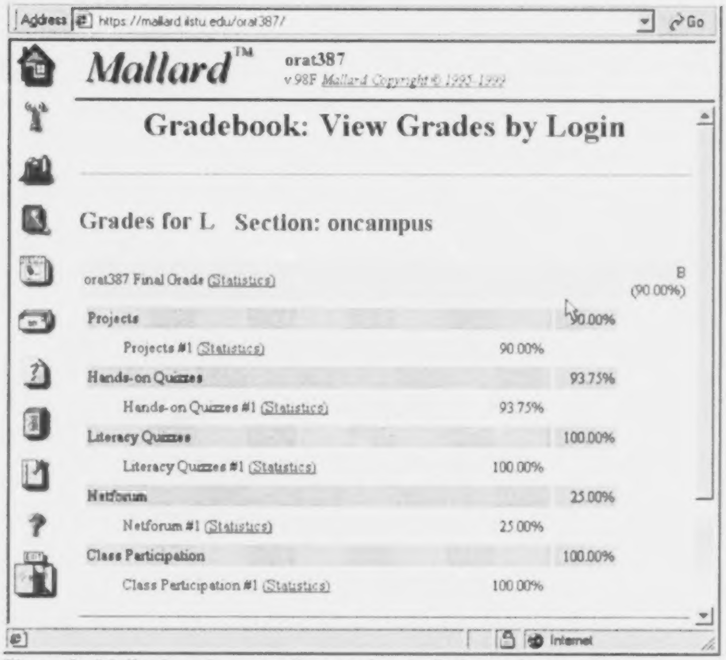

Address https://mallard.ilstu.edu/orat387/
Go
Mallard™

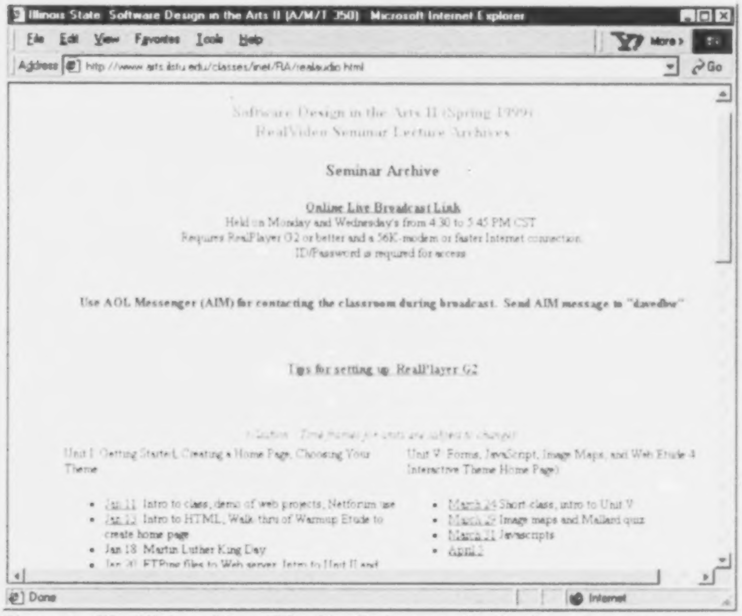
orat387
v 98F Mallard Copyright © 1995-1999

Gradebook: View Grades by Login

Grades for L Section: oncampus

orat387 Final Grade (Statistics)			B (90.00%)
Projects		90.00%	
Projects #1 (Statistics)	90.00%		
Hands-on Quizzes		93.75%	
Hands-on Quizzes #1 (Statistics)	93.75%		
Literacy Quizzes		100.00%	
Literacy Quizzes #1 (Statistics)	100.00%		
Netforum		25.00%	
Netforum #1 (Statistics)	25.00%		
Class Participation		100.00%	
Class Participation #1 (Statistics)	100.00%		

Figure 5. Mallard grade report for a student in Software Design in the Arts


Illinois State Software Design in the Arts II (A/M/T 350) Microsoft Internet Explorer
File Edit View Favorites Tools Help
More »
Address http://www.arts.ilstu.edu/classes/inet/RA/realaudio.html
Go

Software Design in the Arts II (Spring 1999)
RealVideo Seminar Lecture Archives

Seminar Archive

Online Live Broadcast Link
Held on Monday and Wednesday's from 4:30 to 5:45 PM CST
Requires RealPlayer G2 or better and a 56K-modem or faster Internet connection.
ID/Password is required for access

Use AOL Messenger (AIM) for contacting the classroom during broadcast. Send AIM message to "davedbw"

Tips for setting up RealPlayer G2

(Caution - Time frames for units are subject to change)

Unit I: Getting Started, Creating a Home Page, Choosing Your Theme

- Jan 11 Intro to class, demo of web projects, Netforum use
- Jan 13 Intro to HTML, Walk thru of Warmup Etude to create home page
- Jan 18 Martin Luther King Day
- Jan 20 FTPing files to Web server. Intro to Unit II and

Unit V: Forms, JavaScript, Image Maps, and Web Etude 4 Interactive Theme Home Page)

- March 24 Short class, intro to Unit V
- March 29 Image maps and Mallard quiz
- March 31 Javascripts
- April 2

Done
Internet

Figure 6. The Web archive of RealAudio lectures for the fine arts course.

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Table 1
Inventory of Instructional Technology Techniques

Technology Tool	*Course*	*Strategy*	*Application*
Web documents	EC/FA	Present	Distribution of class documents
RealAudio/Video	FA	Present	Archived & live online delivery of instruction
Mallard Gradebook	EC/FA	Present	Online access to personal evaluation and immediate feedback on progress
Forms (CGIMail)	EC/FA	Interact	Online, format student responses and quick surveys, One-Minute Paper
Email critiques	EC/FA	Interact	Electronic quality exchanges of information between instructor and student
Listservs & NetForum	EC/FA	Interact	Archived interaction & discussion (bullet board style)
AIM & Chat	FA	Interact	Real-time conversations
Mallard Quizzes	EC/FA	Interact	Practice exams, online exams with automatic feedback
Web-based guides, tutorials, and labs	EC/FA	Guide & Explore	Rich sets of learning resources create by the instructor for the students, or generated by the students themselves
Interactive database (Tango)	EC	Guide & Explore	Online, interactive publications of student research

Note: EC = Economics; FA = Fine Arts

Table 2
Survey of Faculty Needs and Attitudes for Instructional Technology

Statement 1: For instructional technology to be effective, it must first be driven by pedagogical needs and goals.

```
                 1         2          3          4          5        All
beginner      3.45      3.45       6.90      20.69      65.52     100.00
intermediate  5.17        --       6.90      15.52      72.41     100.00
advanced      5.56        --       5.56      16.67      72.22     100.00
All           4.76      0.95       6.67      17.14      70.48     100.00
```

Statement 2: When I seek technical help it is when I want to know how to accomplish a specific task using technology.

```
                 1         2          3          4          5        All
beginner      3.45        --      10.34      44.83      41.38     100.00
intermediate  3.45      8.62       8.62      39.66      39.66     100.00
advanced      5.56        --       5.56      22.22      66.67     100.00
All           3.81      4.76       8.57      38.10      44.76     100.00
```

Statement 3: I prefer to pick the one application I need to solve a specific pedagogical problem rather than having to adopt a "Swiss-army-knife" Web tool that does everything.

```
                  1          2          3          4          5        All
beginner      13.79       6.90      44.83      17.24      17.24     100.00
intermediate  10.34      18.97      15.52      29.31      25.86     100.00
advanced      11.11      11.11       5.56      27.78      44.44     100.00
All           11.43      14.29      21.90      25.71      26.67     100.00
```

Statement 4: I want one "Web tool" that does everything for (e.g., mail, chat, web pages, grades, etc.).

```
                  1          2          3          4          5        All
beginner       6.90      17.24      37.93      24.14      13.79     100.00
intermediate  24.14      20.69      24.14      17.24      13.79     100.00
advanced      38.89      16.67      11.11      16.67      16.67     100.00
All           21.90      19.05      25.71      19.05      14.29     100.00
```

Statement 5: Most "Web-tools" (e.g., Mallard and WebCT) simplify the task of creating online instructional materials by making assumptions about the structure and shape of courses and teaching that reduce my flexibility.

```
                  1          2          3          4          5        All
beginner      10.34      13.79      68.97       3.45       3.45     100.00
intermediate   8.62      15.52      55.17      15.52       5.17     100.00
advanced      22.22      16.67      33.33      22.22       5.56     100.00
All           11.43      15.24      55.24      13.33       4.76     100.00
```

Statement 6: Demonstrations of the success and failure of other faculty technology projects is a waste of time.

```
                  1          2          3          4          5        All
beginner      41.38      37.93      10.34       6.90       3.45     100.00
```

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intermediate	36.21	32.76	18.97	6.90	5.17	100.00
advanced	55.56	11.11	16.67	5.56	11.11	100.00
All	40.95	30.48	16.19	6.67	5.71	100.00

Statement 7: I would like more faculty showcases of instructional technology that demonstrate real-world applications in the classroom.

	1	2	3	4	5	All
beginner	3.45	10.34	27.59	37.93	20.69	100.00
intermediate	8.62	10.34	17.24	34.48	29.31	100.00
advanced	22.22	--	11.11	27.78	38.89	100.00
All	9.52	8.57	19.05	34.29	28.57	100.00

Statement 8: I would use more instructional technology in my classes if I felt that there was sufficient support on campus to help me with the implementation.

	1	2	3	4	5	All
beginner	6.90	10.34	17.24	37.93	27.59	100.00
Intermediate	13.79	13.79	15.52	34.48	22.41	100.00
advanced	27.78	16.67	5.56	27.78	22.22	100.00
All	14.29	13.33	14.29	34.29	23.81	100.00

Statement 9: The difficulties of knowing where and from whom to seek help on campus create a barrier to the adoption of instructional technology.

	1	2	3	4	5	All
beginner	3.45	6.90	13.79	44.83	31.03	100.00
intermediate	8.62	20.69	12.07	37.93	20.69	100.00
advanced	11.11	16.67	11.11	27.78	33.33	100.00
All	7.62	16.19	12.38	38.10	25.71	100.00

Statement 10: The greatest impediment to my seeking training in instructional technology is the lack of release time.

	1	2	3	4	5	All
beginner	17.24	6.90	13.79	24.14	37.93	100.00
intermediate	12.07	17.24	13.79	39.66	17.24	100.00
advanced	16.67	--	27.78	33.33	22.22	100.00
All	14.29	11.43	16.19	34.29	23.81	100.00

Statement 11: Some tangible rewards and incentives for spending time developing classroom technology would do more to motivate me than more training.

	1	2	3	4	5	All
beginner	20.69	10.34	17.24	31.03	20.69	100.00
intermediate	6.90	13.79	18.97	37.93	22.41	100.00
advanced	22.22	16.67	5.56	22.22	33.33	100.00
All	13.33	13.33	16.19	33.33	23.81	100.00

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Statement 12: The lack of campus grant funds to support the development of instructional technology is a major deterrent to its adoption.

	1	2	3	4	5	All
beginner	--	10.34	31.03	44.83	13.79	100.00
intermediate	10.34	15.52	25.86	31.03	17.24	100.00
advanced	5.56	5.56	22.22	44.44	22.22	100.00
All	6.67	12.38	26.67	37.14	17.14	100.00

Statement 13: The lack of time is the most critical barrier to my experimenting with technology.

	1	2	3	4	5	All
beginner	3.45	13.79	--	6.90	75.86	100.00
intermediate	5.17	1.72	5.17	41.38	46.55	100.00
advanced	11.11	--	11.11	33.33	44.44	100.00
All	5.71	4.76	4.76	30.48	54.29	100.00

EDUCAUSE *Information Resources Library*

Transforming Education Through Information Technologies

Abstract

Category: Papers Presented at EDUCAUSE annual conferences

ID Number:	EDU9948
Title:	Digital Libraries: Potential and Risks
Author:	Barbara E. McMullen, Bonnie Postlethwaite, Miriam J. Masullo
Organization:	Tufts University, IBM Corporation
Year:	1999
Abstract:	It is hoped that, some day, digital technologies will make knowledge and information available, expediently and without barriers through gigabit networks and digital libraries. The technologies and events that combined are called "digital library" are presented. The potential is contrasted with technology misconceptions and potential social risks. This paper summarizes the EDUCAUSE '99 presentation about the Tufts University Smart Digital Library prototype projects.

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Long Beach
EDUCAUSE '99
OCTOBER 26-29

Digital Libraries: Potential and Risks

By Barbara E. McMullen, Tufts University, Miriam J. Masullo, Ph.D., IBM Corporation, and Bonnie Postlethwaite, Tufts University

Presentation scheduled for Track 5, Thursday, October 28, 1999, from 8:15 am - 9:00 am in Rooms D-H of the Hyatt Hotel

http://www.educause.edu/conference/e99/e99_index_main.html

Abstract

It is hoped that, some day, digital technologies will make knowledge and information available, expediently and without barriers through gigabit networks and digital libraries. The technologies and events that combined are called "digital library" are presented. The potential is contrasted with technology misconceptions and potential social risks. Interactive group discussion follows a presentation of the Tufts University Smart Digital Library prototype projects, funding models, development teams, governance issues, roles of School libraries and faculty participation. This paper summarizes the conclusions of the presenters.

Tufts University Academic Technology

The mission of Tufts University Academic Technology **AT@Tufts** is to establish a unified technological infrastructure, facilitate appropriate technologies, and provide an atmosphere of support and flexibility for schools, faculties, and students as they incorporate technology into the curriculum for teaching, learning and research. **AT@Tufts** also advocates for the initiatives of the Tufts Information Technology Council (ITC), the Academic Affairs Subcommittee of the ITC (AAS), and other University technology committees that, in turn, guide the equitable deployment of technologies in support of the academic mission. The mission requires insurance of a technological core and proper level of IT knowledge, expertise, facilities, and support as well as a capacity to accomplish selected initiatives deemed by the academic community as likely to achieve excellence given Tufts' resource constraints. To sustain the mission it is mandatory for **AT@Tufts** to also nurture new and emerging technologies, incubate them, and make them available for experimentation and creative development.

Tufts University Library Technology Services

Tufts University Library Technology Services (ULTS) provides the technological infrastructure, planning and support for library technologies at the University. The department directly supports the library automation system (DRA) and Web-based services for the four autonomous libraries at Tufts. The libraries share the library catalog and as a group license a number of cross-disciplinary databases. The group is key in the examination and implementation of new technologies deemed appropriate for the Tufts libraries. ULTS represents and advocates for the libraries in a variety of information technology committees including the Information Technology Council, the Information Architecture Committee, and the Information Technology Policy Oversight Committee. ULTS reports to the University Provost and works in close collaboration with the University Library Council and AT@Tufts. University Library Technology Services (ULTS)

Tufts University Digital Library Initiative

"The Tufts Smart Digital Library is a vehicle for managing knowledge and information in digital format that allows for interactive user interfaces and supports teaching, research, and lifelong learning." A Tufts University Digital Library Task Force, reporting to the Academic Affairs Subcommittee of the Information Technology Council, will define, analyze and make recommendations on how "digital libraries" can most effectively and efficiently enhance teaching, learning, research and administration at Tufts. The co-chairs of the committee are Barbara McMullen, Director, Academic Technology, and Bonnie Postlethwaite, Director, University Library Technology Services. Each school has been asked to submit names of up to two faculty representatives for this group who will pursue the following:

- Defining what a university-wide digital library will be for Tufts that is responsive to the rapidly evolving technologies and ever changing curricular needs. Such a library should allow for access to the entire digital collection through robust search engines while providing flexibility in front-end design for instructors and librarians.
- Defining how the Tufts digital library will affect culture here and abroad.
- Identifying roles of participants in the digital library.
- Recommending policies relating to content development, ownership, retention, preservation and removal.
- Establishing rules and standards for metadata, copyright management, and access for Tufts and non-Tufts users.
- Recommending the technical infrastructure for the ongoing support of a digital library based on experience with a model which consists of a collaboration of existing digital library projects:
    - **Artifact**

      Artifact, the creation of Dr. Eva Hoffman, Arts, Tufts University, is a digital library of more than 80,000 images used in conjunction with more than three Art History courses at Tufts. Artifact features slides of art from all over the globe, including works from the Islamic, Armenian, and African cultures and provides tools for investigating comparisons between works of art in particular time periods, geographical regions, and cultures.

      Click here for additional information.
    - **Bolles Collection**

      Greg Colati, the Tufts University Archivist, has been digitizing the Bolles Collection, and particularly the maps of London for inclusion in the Tufts digital library. The project is funded by the Berger Foundation.

      Original Berger Foundation grant proposal and **Presentation at DRH conference.**
    - **Health Sciences Database**

      The Health Sciences Database is a digital library of curricular materials used by the Tufts' Medical, Veterinary Medicine, and Dental Schools.

      Click here for additional information.
    - **Perseus**

      Dr. Gregory Crane, Classics, Tufts University, is currently funded by the NSF DLI-2 initiative to continue the building of The Perseus Project. Perseus is an evolving digital library of resources for the study of the ancient world and beyond. Dr. Crane is the Editor and Chief of the project.

Click here for additional information.

- **Crime and Punishment**

  Crime and Punishment is the creation of Dr. Kent E. Portney, Political Science, Tufts University. Crime and Punishment consists of court room scenerios and images that are stored in a digital library and used for demonstrating the complexities of certain kinds of decision making. It can be used to demonstrate possible biases, to examine patterns, or as a teaching tool. Students can use it to determine what causes judges to rule in the ways they do, or to examine their own prejudices.

  Click here to experience Crime and Punishment.

- Identify a project plan and budgetary requirements for the model for approval by AAS.
- Educating the Tufts community about digital libraries and promoting the benefits of having one.
- Evaluating the model and making recommendations for ongoing governance, funding, scope, organization, and support of a Tufts Digital Library.
- The task force will conduct its work over a 2-year period. The need for oversight for the Tufts Digital Library will be evaluated and recommendations will be made at that time. Membership on this task force includes:
  - Librarians / Archivist as appointed by University Library Council (the Council has representatives from each of the University's libraries)
  - Academic Technology staff as appointed by the Director of Academic Technology
  - Faculty / Researchers from each school (The seven Tufts University Schools are: Arts and Sciences, Fletcher School of Law and Diplomacy, School of Dental Medicine, School of Medicine, Sackler School of Graduate Biomedical Sciences, School of Nutrition Science and Policy, and the School of Veterinary Medicine)
- The task force also relies on the expertise found in the existing ad hoc Digital Library Design Team. The committee taps members of this team, and others, for working groups that address specifics of the digital library design. The team also serves as a resource for feedback and input to the Committee on the many questions that will arise.

A pictorial representation of the Tufts Smart Digital Library that summarizes the scope and intent of the project can be viewed at
The Tufts Smart Digital Library: Concept Chart or **(PDF)**

Digital Library Philosophies

Taking a more cultural, social and philosophical approach to understanding digital libraries may help to yield the future perspective that lies ahead for this technology. With the Tufts Digital Library Seminar pages we have attempted to elicit new thinking and considerations for digital libraries. In the following sections those considerations are highlighted

Technology Evolution

Digital Libraries may be perceived as an evolving technology. It could be that they are much more than that, and in fact part of an evolving knowledge continuum. From the technology perceptive, digital libraries have roots in the *information management* systems of the late 80's and early 90's. Multimedia authoring tools started to become popular in the early 90's as well and eventually merged with database systems and API's to become *data management* systems. But it was not until the Internet became public that *networked-multimedia* and eventually the Web captured the imagination of all with a concept old and novel at the same time: *the digital library*.

Click here for a continuation of this discussion.

Community of Users

Today the concept is evolving, from a large, sometimes thought of as *global library*, *global museum*, *global campus*, etc., anything big, to much more community (of users) oriented environment, even personal in some cases. We now see an emergence of dedicated Web sites that focus on health care, finance, education, and every conceivable bounded domain, as opposed to global libraries. We arrive at these *dedicated library spaces* by means of *portals* and even personalize what we wish to see in them.

Click here for a continuation of this discussion.

Enabling Technologies

Infrastructure is no longer just the Internet backbone. The complexity of the *dedicated infrastructures* rivals content when it comes to adaptability. It is possible to configure everything in the digital library space, from the color of the links, to the alerting sounds, to the organization schemas. Indeed there's no global library; these are personal and always newly made libraries. Components of the infrastructure have to accommodate the access, distribution and media needs of each user.

Click here for a continuation of this discussion.

Architecture and Processes

There's not a single global definition for the term "digital library", and how we define a digital library depends on what it is for a given user at a given time. It's *characteristics* change with use and with time. Users contribute to as well as make use of the digital library. Even a simple search provides clues that help to modify or enhance the digital library space for the next user and *user moment*. In addition, this constant evolution by usage creates a kind of *ecology of information* that further helps to evolve the concept (of a digital library) itself.

Click here for a continuation of this discussion.

Culture Affecting Aspects

Some significant aspects of this phenomenon are taking place with the penetration of *data mining* and *knowledge discovery* technologies. Data mining alters the digital library is ways that are completely unpredictable, by virtue of the discovery process. A data miner does not know what he or she will discover or where the search will go, as it goes beyond extracting information to actually revealing information. In that respect a special *human-information relationship* paradigm emerges. A given person has the potential to alter the digital library in ways that nobody else perhaps can. This has the same social consequences that make us reflect on the issue of equity of access. The more diversely used, the richer it becomes.

Click here for a continuation of this discussion.

More Potential

The opportunities for exploiting new technologies in the university campus continue to increase as national and international focus on these technologies invades more and more the common culture and the media. The Internet and the Web, in particular are already part of our American life-style. Efforts to connect every school and classroom in America must be coupled with an infrastructure at the university level that is prepared to receive Web-ready students. That infrastructure is today the campus digital library.

Many universities, like Tufts, have strategies and committees in place to support the digital library as efficiently and carefully as the traditional library is maintained. Surprisingly, this has caused many campus (physical) library structures and facilities to undergo renovations and enhancements to augment and modernize for accommodating the new technologies. In short, there has been a marrying of library cultures (physical and digital) to provide the best functionality and quality of services for the students. Indeed what was expected to be an "atoms to bits" future, is increasingly becoming an "atoms and bits" reality.

At Marist College, collaboration with the FDR Library is producing results that contribute to the preservation of the physical media and much increased access to the intellectual media, as expected. Similar results are expected are Tufts with *Perseus* and *Artifacts*, for example. In that respect, digital library technologies promise much potential cultural (preservation) and educational (access) gains.

Less Risks

It should not be forgotten for one moment that equity of access has not to this day been achieved, and in 1998, we still had only 39% of poor classrooms online. But even in this climate of much concern (haves and have-nots), need for legislation (E-rate), and even panic (Digital Divide Report), at least at the academic level a course has been charted where the digital library complements, and is a part of the traditional library, academic computing and, even curriculum. The digital library could play many more roles in the campus environment of the future. The impact of this *technology diversification* is yet to be assessed.

The Road Ahead is only a Few Steps to the Laptop

E-commerce and click-trade have not been factored into the campus equation. *Distance Learning* is today evolving into *Close-by and Personal Learning*. Students will be able to find courses in an *open global campus* space to match their interests and academic potential, and they can find these resources in their own laptop, wherever they happen to be. *Inter-campus digital libraries* will offer the best educational fit for students in any campus, and the global campus will become part of a *global academic spectrum* available to all of academia.

Information, media, perhaps knowledge, are all in the digital library. We once sought to put as much of it as possible in books, we then tried to make some of it come into our living rooms through a cable-box, and we now bring it all everywhere and anyhow in a web. As we continue to evolve, culturally, socially and politically, this globally shared digital library that once was called "television" and today is called "the Web", is becoming just simply a "community of media" that is shared in ever more effective and meaningful ways. Let's hope that this new dimension that's as close as the span of a hand will be open space and as equally shared by all as it is built by all.

References

Pictorial representation of the Tufts Smart Digital Library at
The Tufts Smart Digital Library: Concept Chart or **(PDF)**

Annotated links at
http://www.tufts.edu/tccs/at/digital-library/other.shtml

Tufts University Academic Technology at
http://www.tufts.edu/tccs/at/

Primary resources for the presentation are available at
http://www.tufts.edu/tccs/at/austin-lecture/archives/Miriam/dllec.htm

Crime and Punishment is located at
http://www.tufts.edu/tccs/services/css/crimeandpunishment.html

The Perseus Project is located at

http://www.perseus.tufts.edu

The Health Sciences Database is located at
http://hsdb.hsl.tufts.edu

These resources are continually updated on the Tufts Academic Technology Web pages.

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EDUCAUSE Information Resources Library

Transforming Education Through Information Technologies

Abstract

Category: Papers Presented at EDUCAUSE annual conferences

ID Number: EDU9940

Title: Digitally Invested: Teaching and Learning with Online Images

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Organization: James Madison University

Year: 1999

Abstract: The Digital Image Database instructional system was developed in response to increased student enrollment generated by the new General Education program at James Madison University. Already utilizing its resources to the fullest, the Visual Resources Center projected its inability to meet demands of added course sections and instructors. In 1998, faculty members were awarded an in-house grant from the Center for Instructional Technology to develop a system to alleviate this strain. This system is an example of how technology can positively impact faculty and student success when appropriately integrated into the teaching and learning process. This paper encompasses project development and design, cost, instructional impact, institutional impact, and faculty and student assessment.

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DIGITALLY INVESTED: TEACHING AND LEARNING WITH ONLINE IMAGES

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ABSTRACT:

The Digital Image Database instructional system was developed in response to increased student enrollment generated by the new General Education program at James Madison University. Already utilizing its resources to the fullest, the Visual Resources Center projected its inability to meet demands of added course sections and instructors. In 1998, faculty members were awarded an in-house grant from the Center for Instructional Technology to develop a system to alleviate this strain. This system is an example of how technology can positively impact faculty and student success when appropriately integrated into the teaching and learning process. This presentation will encompass project development and design, cost, instructional impact, institutional impact, and faculty and student assessment.

DIGITALLY INVESTED: TEACHING AND LEARNING WITH ONLINE IMAGES

Started in 1998, the General Education Program is the core academic program of James Madison University, required of all students regardless of their major or professional program. This program is intended to provide students with a solid foundation of knowledge, skills, and experiences and to prepare JMU students to be flexible thinkers and life-long learners (see http://www.jmu.edu/gened/message.html). Implementing this academic program has greatly impacted all members of the JMU campus community. Faculty express philosophic differences as to the benefits of the program and the reassignment of faculty positions to teach General Education courses. Budget funds have been reallocated to support the new core curriculum and students are now seeking new paths through which to navigate the completion of core educational requirements. In addition, service units are struggling to support the demands of newly created course sections and faculty positions.

The Digital Image Database instructional system was developed in direct response to increased enrollment and instructor need generated by the new General Education program in general and, as a result, two Survey of World Art courses in particular. In the first year of the General Education program, the Survey of World Art courses provided one of the few means of completing the Arts and Humanities requirements. As a result, the Art and Art History Department was required to shift from teaching two or three sections of the Survey of World Art courses per year (prior to 1998) to instructing a total of twenty-four course sections in the 1998-1999 academic year alone. These two courses, GARH205B, Survey of World Art I: Prehistoric to Renaissance and GARH206B and Survey of World Art II: Renaissance to Modern, now provide many students with a path through the Arts and Humanities requirements (see http://www.jmu.edu/gened/cluster2.html).

In 1997, already utilizing its resources to the fullest, the Visual Resources Center in the Art and Art History Department projected its inability to meet demands of added course sections and instructors created by the General Education program. Not only would there not be enough slides in the collection to provide faculty with necessary teaching resources, but what slides were available were degrading in quality. Unable to acquire resources from other sources, faculty and staff in the Art and Art History Department turned to the mGrants program, an in-university technology grants program, hoping to preempt the anticipated strain. In 1998, an Art and Art History faculty member and the director of the Visual Resources Center were awarded a grant to develop a digital image database and multimedia teaching tool. Currently, faculty and students from the humanities, music and mathematics use the system in and out of the classroom.

THE DIGITAL IMAGE DATABASE INSTRUCTIONAL SYSTEM

The Digital Image Database instructional system is composed of two individual components: the Digital Image Database and the Image Viewer. The DID is a secure web site that permits faculty members to generate and package slide shows at their convenience. Instructors search through thousands of digital images, selecting and sorting the images based on a range of instructional criteria. After organizing selected images for classroom presentation, instructors are able to store slide shows for immediate use in class, annotate and edit slide shows, provide online shows for students review, or archive slide shows for future discussions. Once a slide show has been created, the show may be viewed in class using the second application, the Image Viewer. A Macromedia Director application, the Image Viewer permits faculty to download thumbnail, full-sized and double sized versions of each image in the slide show they created and project these images in a classroom containing appropriate equipment. Instructional manuals for the applications are available to faculty online.

THE CIT mGRANT PROGRAM

The Digital Image Database (DID) instructional system was developed through a CIT Fellowship grant from the mGrants program, supported and awarded by the Center for Instructional Technology at James Madison University. mGrants are divided into three categories: Small Grants, Learning Enhanced Grants, and the CIT Fellowship. While small Grants may be proposed at any time during the year, proposals for Learning Enhancement Grants and the CIT Fellowship are generally submitted every October. A more detailed description of each type of grant follows:

- Small Grants - Small Grants provide timely assistance for projects or activities to support year round faculty needs in instruction. Generally, small grants are for particular software applications, the transfer of computing or peripheral equipment from the CIT to faculty, or the award of staff time to assist in the development of a specific project.
- Learning Enhancement Grants - These grants provides up to $6,000, which may be used during any semester to develop a project related to the enhancement of teaching and learning. Extra consideration are given to proposals which demonstrate support from the faculty's department or college. Receipt of a Learning Enhancement Grant requires the submission of a final report within one semester after completion of the project. Receipt of a Learning Enhancement Grant also may require assessment of the impact of the technology on the course.
- CIT Fellowship - The CIT Fellowship provides *up to $15,000* for course development. Receipt of the CIT Fellowship requires the submission of a final report within one semester after completion of the project, full assessment of the impact of the project, and involvement of a CIT Project Director. Extra consideration is given to proposals which demonstrate support from the faculty's department or college. Salary: During the summer, Fellowship recipients receive a stipend equal to one 3-hour class for one term, with a cap of approximately $5,000. During the academic year, the department of the fellowship recipient receives the stipend, in order to pay for a substitute instructor.

To assist faculty in the creation of their mGrant proposals, a workshop is offered by the CIT and examples of awarded proposals are placed online after receiving the author's permission. CIT staff members are available to assist faculty in the preparation of proposals – particularly in the creation of a budget and an assessment plan – as well as in the production process. CIT staff can provide or contribute to instructional planning, design of instructional materials, production of instructional materials, and obtaining resources for project implementation. The number and size of grants vary from year to year depending on available funding. Operating funds are available for producing materials related to project implementation; however, these funds must be requested in the proposal budget.

mGrant Proposal Guidelines

All Small Grant submissions must include a cover page and a brief description of the project. The cover page should contain a project title; a project abstract not to exceed 250 words, the names, the department, and the titles of all participants. If a department or college offers to support the project, this should be mentioned in the description as well. Learning Enhancement Grant and CIT Fellowship submissions must contain a cover page, narrative, budget and departmental or college endorsements. Narratives are limited to five pages and should contain a statement of purpose, a course description, educational objectives, a proposed timeline, a project plan, a plan for evaluation outcomes, and a statement of anticipated impact and benefits of the project. Critical elements of the proposal must be addressed in the narrative body; however, appendices may be attached.

mGrant Awards: Review Process and Selection Criteria

The CIT mGrants Committee consists of seven teaching faculty members appointed by an appropriate academic dean or program director. The CIT Grant committee has representation from the College of Arts and Letters, the College of Business, the College of Education and Psychology, the College of Integrated Science and Technology, the College of Math and Science and the General Education program and the Office of Assessment and Research Studies. Committee appointments often vary from year to year.

In late October, each committee member receives a criteria sheet for rating and reviewing the grant applications and a portion of received proposals. (The CIT receives approximately 20 proposals each year.) In addition to the mGrants Committee review, CIT staff performs an internal review of all proposals, to determine the feasibility of the proposal, the suggested technology and the project budgets. This review is used by the Director to inform the grant committee discussion in the formal review. The Director of the CIT, mGrants Program Director and mGrants Committee determine an appropriate cut-off score based on committee and staff review. The selection process continues by discussing the merits of each proposal falling above the cut-off score. The CIT Secretary Senior documents the discussion. The mGrants Committee recommends the award of proposals that rated highest in the areas of need, purpose, impact, project plan, evaluation, budget and continued use.

DIGITAL IMAGE DATABASE: PROJECT BACKGROUND

In the case of the Digital Image Database, the need for the project was immense. Without the creation of a technological system for faculty to teach with, resources were unavailable to meet the demand of additional course sections. There would be no alternative and no other method for meeting the need for these students and faculty. In hopes of easing the strain of resources for the additional instructor and course load, Art and Art History faculty hoped to create a digital image library for the Survey of World Art courses. Particularly, they hoped that the development of this system would provide a better learning environment for students by allowing those students to study the actual images used in class regardless of time and location. In addition they hoped to provide a valid teaching tool for faculty.

Upon initial committee review, it was clear that the project plan was unrealistic. Work would need to begin on the project only a few months before a minimum of one thousand images were needed for classroom use. The environment was high pressure, with a microscope on both the CIT and the faculty who developed the proposal. In addition to a challenging timeframe, the budget was unrealistic and the learning curve was tremendous regarding cost and resources. Art and Art History faculty and university administrators had no conception of the cost or resources required to complete such a project. However, the project had a bright future and would solve an obvious and critical need. Once the underlying system was developed, additional images from the Visual Resources Center and other disciplines had the potential ability to be added to the system and used in almost any classroom setting.

Project Tasks and Process

To date, the total resource committed to the development of the digital image database by both the principle investigators and CIT personnel total 1700 hours and over $60,000. Project tasks included project overview and management, cataloging, production of image database and multimedia viewing system, scanning and editing images, remounting and labeling slides, assessment, and administration of the system server. Project development and implementation spanned the three year process outlined below:

Spring 98:

- Began project management and meetings with the principle investigators to outline responsibilities and duties of content experts and CIT, the order images would be scanned and scanning schedules
- Programmers independently researched off-the-shelf products and determined to develop the application(s) in-house
- Support hardware and software was purchased (e.g. Slide Scanner, Flatbed Scanner, Power supply (uninterrupted), storage media, NT server)
- Primary focus was selecting, digitizing slides and assessment rate and quality of product
- Visual Resources Center accepted responsibility for seeking copyright permissions – to be supported by CIT

Summer 98:

- Continued digital slide translation and project assessment
- Issues regarding application development were reviewed (e.g., cross platform functionality, designations of primary and secondary web browsers, ease of development, availability of robust Internet connectivity, flexibility and control over visual workspace and caching, development start and finish dates, development of process to speed creation of three sizes per image)
- Development of DID applications were started and completed – programmers created a hybrid technical solution to include a Macromedia Director application and the World Wide Web

Fall 98:

- Interface redesign based on feedback from faculty, staff, student use
- Trained Art and Art History faculty and Graduate Assistants on system
- Scanning continued and included outsourcing to a photographic services company to meet time and need demands of faculty
- Monitoring and adjustment of system
- Formal faculty and student assessment by CIT

Spring 99

- Continued slide translation and project assessment (minimal image additions to database)
- Extended faculty participation in use of database
- Monitoring and adjustment of system
- Formal student assessment by CIT

Summer 99

- Continued slide translation (minimal image additions to database)
- Extensive revision of system based on assessment data, technical and graphical user interface needs
- Formal student assessment by CIT

Fall 99

- Continued slide translation (minimal additions to database)
- Extended faculty participation in use of database (particularly across disciplines)
- Faculty and GA training on use of system
- Monitoring and adjustment of system
- Conclusion of formal faculty and student assessment by CIT
- Final report on Digital Image Database submitted

Design and Development Issues

Selecting Images - The grant recipients anticipated that the increase in enrollment and addition of course sections and instructors would strain the availability and preservation of the 35mm slide in image collection of visual resources center. Some main sources included the Visual Resources Center, personal and museum collections, student pictures from trips abroad and scanned images from books.

Acquiring Permissions To Use Images - The Visual Resources Curator at JMU is responsible for acquiring copyright permissions for the works in the database. Each image currently in use has been reviewed and placed into a low risk or high risk category. Low risk images include individual slide collections of faculty and images in the public domain. High risk images include image from commercial slide collections or images of living artists. Copyright permission for use of high risk images is sought first. As much as possible, the Visual Resources Center has endeavored to seek permission from and incorporate the slide collections of JMU faculty into the database. Both applications of the DID instructional system run from a secure server in a unique password environment. Only faculty members are able to access large, high-resolution images used in a face-to-face classroom setting. Students must use their JMU user identification and class password to access slightly lower resolution images used in faculty lectures.

Developing A Cataloging System - The Visual Resources Curator at JMU is also responsible for developing the cataloging system of the image database to meet specifications and needs of faculty search criteria. Database Records use a trimmed down version of a full fine arts catalog used in the Visual Resources Center. The fields used by the Center for describing works of art correspond directly to the VRA (Visual Resources Association) Core Categories Version. 2.0. The Visual Resources Curator and faculty discussed common search practices and the minimal number of fields necessary to search and find the desired works of art. Together, the curator and faculty participants decided on six common criteria: artists name, title, period, medium, style, and keywords.

Scanning Images - Slide scanning was done both in the Center for Instructional Technology as well as subcontracted out to various photographic companies. In the Center for Instructional Technology, both CIT personnel and student associates were utilized extensively to complete most all digitizing and correcting prior to the start of the 1998 fall semester. While there are many slide of museum quality, numerous personal photographs were faded and a number of slide in damage from extensive use, overexposure, or dust inside slide mounts or embedded into the film emulsion. All slides/images were scanned at 200 dots per inch (dpi) and edited or corrected based on color, damage and comparability to the original work of art. Completed scans were resized to 144 dpi and made accessible to the database in three sizes.

The Mounting And Labeling Slides From Visual Resources Center - In order to scan a series of images, slides from the Visual Resources Center were removed from their glass casings and placed into specifically sized plastic casings for scanning. Once those slides were scanned and returned to the Visual Resources Center, the slides were remounted into glass casings and relabeled so that they could be returned to the Visual Resources Library, for more traditional teaching and learning uses.

Training Faculty – Each start of the academic school year, CIT provided a training session for Art and Art History faculty and Graduate Assistants on use of the Slide Show Builder and Viewer. This training walked DID users through the process of creating a new slide show, archiving slide shows, editing and annotating slides, and permitting students to view online lectures created with the Slide Show Builder. This training session also highlights the use and features of the in-class slide Image Viewer application. Personalized one-on-one sessions were held on a needs basis and training documentation is available via the World Wide Web.

Administering The Digital Image Database Server - The DID runs on a Dell 4300 PowerEdge NT server, located in the Library building. The NT server is periodically checked for Y2K compliance and updated with NT service patches. Should the original disk drive fail, a hot-swappable copy of the images is available to plug-in to the NT server. The server is administered within the CIT. The CIT staff works in close association with the Network Services division of the university to track potential server failure, track slowness in network speed, and collaborate in the design of an authentication scheme for the system. Two staff members have access to the actual server, server passwords, and the digital images. Five staff members have the ability to assign accounts to faculty that wish to use the system.

Intellectual Property Rights - The intellectual property policies of JMU are currently under revision. Faculty members are encouraged to review the current intellectual property policies of the university or contact the university Intellectual Property Committee before submitting mGrant proposals. The current policies at JMU indicate that intellectual property rights remain with the faculty member, unless a substantial amount of university resources are used. In the course of two years of the mGrants program, only a small number of grants have used substantial resources. It is the intent of the CIT that the mGrants program promotes faculty entrepreneurial work in the development of instructional technologies and instructional methods.

Copyright - In the world of images, determining who owns the copyright to an image is difficult. Copyrighted works, by definition, deal in tangible mediums. Digital works are difficult to touch. Often, the copyright does not belong to the owner of the object, i.e. a private collector, a museum, but to the creator of that object. In addition, the digital world exacerbates the difficulty of determining what is a copy or what is a derivative work. JMU has endeavored to protect the copyright owners of art by following Educational Multimedia Fair Use guidelines, developed as part of the CONFU (Conference on Fair Use), as a project criteria. Though not law, as many of these issues have yet to be challenged in the courts, these guidelines provided a reasonable foundation for project. There are four components of fair use, including the intended purpose of that use, the nature of the actual work, the portion of the work used, and the potential market value of that work.

Continued Use - JMU is reaching the end of the fair use term defined by the Educational Multimedia Fairs Use guidelines for certain images. Without appropriate copyright permission, many of the current images could be pulled from the database. JMU is in the process of purchasing a site license from AMICO, the American Museum Image Consortium and is initiating talks that should allow the easy incorporation of those images into the database, allowing access to faculty of tens of thousands of digital images.

ASSESSMENT AND INSTRUCTIONAL IMPACT

Assessment Activities

The assessment was designed to take place over the course of four semesters and to provide both qualitative and quantitative data, informing redesign activities and providing information on demographics, baseline statistics, usage statistics and instructional impact. Provided below is an overview of the assessment plan:

SEMESTER	AUDIENCE	PURPOSE	METHODS	DATA
Fall 1998	*Faculty* *Students* *Staff*	Baseline Demographics Usage	*Surveys* *Interviews* *(PI's only)*	Quantitative Qualitative
Spring 1999	*Students*	Demographics Redesign Impact	*Surveys*	Quantitative
Summer 1999	*Students*	Demographic Redesign Impact	*Surveys*	Quantitative
Fall 1999	*Faculty* *Students* *Staff*	Baseline Comp. Impact Process	*Surveys* *Focus Groups* *Interviews*	Quantitative Qualitative

Assessment Results (Highlights)

These instructional system is an example of how technology can positively impact faculty and student success when appropriately integrated into the teaching and learning process. Current assessment data offers a significant correlation between the frequency of student use of the system and their self-perceived interest in Art History, preparation for exams, and learning of course content. Below are a few highlights from gathered data:

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Baseline Comparison - Faculty (Fall 1998)

- Minimal use of technology
- Keen interest in integration of World Wide Web into instruction
- Faculty access to and use of slides was rated as reasonably effective, efficient and organized
- Student access to slides for review and preparation was rated as inefficient, unreliable, inconvenient
- Hours spent by faculty per task per semester: 39 hours selecting slides/images, 19 hours obtaining slides/images, 21 hours organizing for class use, 21 hours organizing for student review
- Main slide/image sources for faculty: Visual Resources Center (32%), personal collections (29%), World Wide Web (16%), CD-ROMS (13%)

Student Demographics (Spring 1999)

- 78% owned personal computer – remaining students access via Campus Lab (37%) or a roommates computer (37%)
- 90% used Windows Operating System
- 89% had network connection

General Usage (Spring 1999)

- 59% access lectures 1-4 times per month
- 19% access lectures online more than 5 times per month
- Biggest reasons for accessing the online slides was exam preparation (53%), study (47%), missing class (4%)
- Biggest reasons for not accessing online slides were: want more slide info (31%), slow connection to internet (26%), no access to computer (17%), instructor didn't mention it (15%)

Requests for Redesign (Spring 1999)

- Accuracy of information
- Images: less download time vs. higher resolution
- Opportunity for instructor analysis, annotation to be added to information
- Better students navigation and display interface
- Faculty option of editing and archived slide show and committing to archived status immediately
- Ability to print online shows and lecture materials

Instructional Impact (Summer 1999)

- Affect on course Research or Project Work: Helped Tremendously (50%), Helped Somewhat (38%)
- Affect on Exam Preparation: Helped Tremendously (68%), Helped Somewhat (27%)
- Affect on Learning Course Content: Helped Tremendously (80%), Helped Somewhat (10%)
- Affect on Interest in Art/Art History: Helped Tremendously (32%), Helped Somewhat (32%)
- Affect on Success in Course Helped Tremendously (54%), Helped Somewhat (27%)
- Affect on Grade in Course: Helped Tremendously (56%), Helped Somewhat (29%)

Baseline Comparison - Faculty (Fall 1999)

- Decrease in task and preparation time?
- Positive and extensive instructional impact?
- Alleviation of time/resource demands on VRC?
- Higher integration of technology into instruction?
- Relief of student and faculty problems with access and review?

Instructional Impact

Although incredibly time-consuming, the Digital Image Database instructional system has had numerous benefits. In addition to unlimited acceptability, faculty and students using the database system are already reaping the advantages of viewing works of art in dynamically new ways. Some of the instructional advantages that are changing the teaching and learning experience of art in Art History are provided below:

- Digitizing and editing images ensures the preservation of slides, permanently establishing and maintaining the integrity of the image and accurate representations of the original works of art.
- Passing a single 35mm slide around to ten faculty members (from a personal collection) is impossible; however, now all faculty are able to access the best slides without burdening the collection of any individual(s).
- No additional damages are incurred to personal and university slide collections even though faculty and students access online images twenty-four hours a day, seven days a week, and from any desired location.
- Students have online access, anytime, to instructor-supplied lectures and slide images. This provides the security, safety and convenience of a campus lab, apartment or home as compared to an often-empty

campus hallway or classroom during prescribed hours.

- Faculty can electronically search hundreds of digital slides and organize selected slides into classroom lectures twenty-four hours a day, seven days a week, independent of the schedule of the Visual Resources Center.
- Descriptive information on all images is available within the Image Viewer. This software feature saves in-class time for faculty and provides appropriate spelling, dates, and pertinent information for students.
- High-resolution images permit faculty to enlarge images and show details in Image Viewer without blurring, pixelation or working with multiple detail slides simultaneously. This permits ease of use and maintains the continuity of viewing. It also provides time for more discussion or the viewing of additional images.
- Flexibility of the software encourages movement within an image, removing the static quality of images and providing what is equivalent to a "walking tour" which incorporates both overview and detail slides. For example, students can progress down a road, frieze, or around a room, by enlarging the image and then dragging the image along a line of view. Discussion can take place at points of interest without breaking a student's attention or an image's fluidity.
- Faculty access the best slides from numerous public and private collections, enhancing the context, environment and accuracy that comes from a variety of perspectives on a single work of art.
- By updating the image database, students can view artwork, sculpture and architecture over time.
- Faculty can show personal or student pictures taken while traveling abroad or on-site.
- Faculty and students have use of a truly anytime, anywhere teaching and learning tool. Shows can created, classes can instructed and students can access and learn from a distance.

THE PILOT – LESSONS LEARNED

There is a technology learning curve for faculty – Education about technology and its integration into the teaching and learning process is critical. Education about technology for content experts and training in the use of the system for all faculty should be integrated into the project life cycle.

There is a content learning curve for technology developers - Technology professionals need to be reminded of the need for patience and the need for service. Design of instructional technology is a collaborative process and technology professionals must be proactive in making that process collaborative. An open and accessible exchange of knowledge is a necessity between technology experts and content experts.

You don't know what you really need until you've done it - Though highly collaborative and extensive redesign has taken place, it is clear that more design changes are needed. As faculty and students use the tool increases, ideas for its improvement and use emerge. As in any design process, it is sometimes the accidents of design that become the most powerful features of the system (i.e. the dynamic viewing of maps and friezes).

The need for infrastructure is larger than you think - It is clear that the development of an innovative instructional system impacts the academic technology infrastructure of the university. Already, faculty are demanding additional technology classrooms, in which they can utilize this teaching tool. In addition to new technology teaching classrooms, faculty are knowledgeable about the types of technology they want in these classrooms. The best projectors are required to teach the visual arts. More computer memory is required to allow faster access to the server images. More development is needed on the system to make it a better teaching tool for all Art History courses and for disciplines beyond Art History. More images are needed.

ACCOMPLISHMENTS AND CONCLUSIONS

Through the Digital Image Database instructional system, a solid framework has been built for future expansion. Though the system now meets needed yearly requirements for over 20 faculty and 2000 students, it is clear that the current system is a stop-gap measure that meets the instructional needs for only two courses. The systems underlying the instructional system have the capacity to grow across even more disciplines.

A second accomplishment rests in the strength of the project due to an interdisciplinary effort. Professionals from the Center for Instructional Technology, the university library, Art and Art History, History, Mathematics, Music and more are providing input for redesign of the system. At the end of this semester, a faculty focus group will provide final input for design for Art and Art History use of the system. In the meantime, a university committee made up of librarians, the Visual Resources Curator, and faculty across the university will determine the future of the system for the university. Questions to be addressed include: How are images added to the system? How is search criteria expanded? What images are appropriate for the system? And how should the system be expanded to incorporate other instructional needs?

Faculty and student satisfaction is high. With the image database and the associated software applications, faculty search the database online, receive nearly instantaneous results and immediately select and organize these results according to preference. In addition, database use removes the necessity to re-file slides for both the Visual Resources Center and faculty since the images are digital and retained on the CIT NT server. The image database addresses issues of student and faculty access. Faculty no longer need to select, locate and organize prints or images for student review. Students will have online access to all slide shows created by their course instructor. The option for faculty to archive created shows can greatly reduce faculty time spent in the selection, location and organization process. Both faculty and students are happy with the system, but anxious to incorporate new ideas.

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EDUCAUSE Information Resources Library

Transforming Education Through Information Technologies

Abstract

Category: Papers Presented at EDUCAUSE annual conferences

ID Number: EDU9946

Title: Duke University's IT Broadbanding Initiative

Author: Angel N. Dronsfield

Organization: Duke University

Year: 1999

Abstract: In June of 1998, in an attempt to increase Duke University's ability to attract and retain talented information technology (IT) employees, a cross-functional team comprised of university IT and human resources staff, along with outside consultants, began designing a broadbanding and recognition program for IT positions. The team was challenged to identify a recognition and rewards strategy that enhanced Duke's ability to recruit and retain IT staff; establish a technical career path for talented IT staff; and create a flexible and competitive compensation program. This paper summarizes the author's presentation at EDUCAUSE '99 about the IT broadbanding initiative at Duke and its initial implementation.

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Duke University's IT Broadbanding Initiative

Angel N. Dronsfield
Duke University
Durham
North Carolina

In June of 1998, in an attempt to increase Duke University's ability to attract and retain talented information technology (IT) employees, a cross-functional team comprised of university IT and human resources staff, along with outside consultants, began designing a broadbanding and recognition program for IT positions. The team was challenged to identify a recognition and rewards strategy that enhanced Duke's ability to recruit and retain IT staff; establish a technical career path for talented IT staff; and create a flexible and competitive compensation program. This presentation will discuss the IT broadbanding initiative at Duke and its initial implementation.

1. Define skills and competencies required for organizational success
2. Align employee skills and competencies with defined organizational needs
3. Recognizing the unique dynamics of the knowledge worker, we will emphasize paying for the person rather than the position and stress other recognition through non-financial methods.
4. Recognizing the financial limitations of the institution, we will balance financial and non-financial rewards in a manner, which provides competitive total rewards and recognition for IT employees.
5. Streamline internal processes and increase management discretion and accountability in employee rewards and development decisions.
6. Increase internal and external recruiting effectiveness through focus on core aptitudes and competencies as opposed to job or task-based job descriptions and encourage lateral moves to develop new competencies and skills.
7. Facilitate self-directed career planning through open communication of classifications, bands, competencies, and achievements/rewards.
8. Emphasize competitive advantage of Duke IT through effective deployment of non-financial rewards.
9. Improve the impact of performance management systems through increased relationship of appraisals to salary increases.

Recognition Strategy

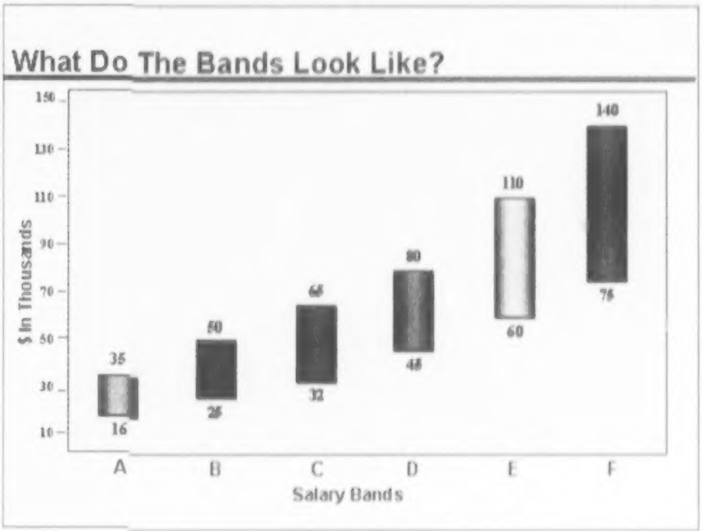
The overall objective of the recognition strategy was that it support the distinct needs of the technology function within multiple areas of the Duke systems. As comparative framework, the Design Team used both national and Research Triangle Park, NC, IT employers, and targeted salary levels around the 50th percentile of the local IT market. Following industry trends, the desired pay mix was primarily base salary, but with significant opportunities for variable and premium pay based upon both exemplar performance and project objectives. To support the need to recognize top performers, the Design Team recommended strongly that all bonuses (spot and project) be openly communicated and not simply included as an additional amount in the regular paycheck. The philosophy of the team was to share the compensation policy and practice information with employees in order to ensure they have a full understanding of the rewards programs and associated decisions, and to further have the rewards serve as incentives for retention and performance. Finally, as a result of the concept of paying for the person instead of the position, internal equity had to be redefined. Rather than comparing salaries of staff members with like titles, the new system would require managers to compare salaries of employees with similar demonstrated competencies. Pay diversity would be commensurate with identifiable skills and competencies.

One key challenge facing the Design Team was to keep the conversion to the new recognition system budget neutral. While it would be acceptable to have expenses increase in the future, the design of the new system must be such that it could be implemented *initially* with no bottom line impact. Therefore, it was determined early in the design phase that no pay adjustments would result from converting to the new system.

Employee Value Proposition

- Represent and act on behalf of the CIOs to ensure successful implementation for MCIS and OIT on schedule
- Each committee member will keep their CIO or Director informed on the progress of the Implementation Team
- Committee members will raise issues to the CIOs for decision making when necessary
- Approve manager band assignments prior to the next level of management beginning the slotting process
- Review and approve communication and training materials and the method of delivery
- Recommend implementation process enhancements for MCIS, OIT and other departments
- Provide oversight and guidance on the implementation process ensuring the intent of the system is maintained and desired outcomes are achieved

1. Receive initial training on the new system and slotting process (in small groups)
2. Attend slotting session with direct manager, possibly his/her direct manager, a member of the Implementation Team, and possibly a peer
3. Receive "approval" of initial slotting from Broadbanding Oversight Committee (through Implementation Team member); subject to final approval from HR
4. Communicate results of slotting process with direct reports individually



EDUCAUSE *Information Resources Library*

Transforming Education Through Information Technologies

Abstract

Category: Papers Presented at EDUCAUSE annual conferences

ID Number: EDU9926

Title: Faster, Cheaper, Better: A State-Wide Approach to Public Service Excellence

Author: Lynda Narwold, Cheryl Stolle, Timothy Sutherland, Brenda Swartz, Christine White

Organization: Indiana University

Year: 1999

Abstract:

University-based outreach programs are increasingly important in a knowledge society. Regional campuses, as well as research and land-grant universities, are playing a growing role in providing their communities with extension services that include all forms of continuing education, technology transfer, economic development, and cultural programming. The use of information technology enables the campuses to overcome barriers of distance, organize data bases, facilitate communication among a range of constituencies, and conduct their public service activities "faster, cheaper, better." This report describes the development of a systemic approach to public service delivery by Indiana University's five regional campuses.

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Faster, Cheaper, Better: A State-Wide Approach to Public Service Excellence

Lynda Narwold, Indiana University Kokomo, Kokomo, Indiana

Cheryl Stolle, Indiana University East, Richmond, Indiana

Timothy Sutherland, Indiana University Northwest, Gary, Indiana

Brenda Swartz, Indiana University Southeast, New Albany, Indiana

Christine White, Indiana University South Bend, South Bend, Indiana

University-based outreach programs are increasingly important in a knowledge society. Regional campuses, as well as research and land-grant universities, are playing a growing role in providing their communities with extension services that include all forms of continuing education, technology transfer, economic development, and cultural programming. The use of information technology enables the campuses to overcome barriers of distance, organize data bases, facilitate communication among a range of constituencies, and conduct their public service activities "faster, cheaper, better." This report describes the development of a systemic approach to public service delivery by Indiana University's five regional campuses.

Summary

The Regional Campus Excellence Project was initiated by the five Indiana University regional campuses--East, Kokomo, Northwest, South Bend, and Southeast--in response to the IU system president's call to make Indiana University one of the nation's top-tier academic institutions. This 18-month project has engaged some 90 faculty members and administrators from all five campuses in the examination of all aspects of their missions, including public service activities. Supported by a grant from the IU fund for campus innovation, the project was assisted by a group of nationally-recognized experts in higher education, but was from start-to-finish guided and directed by campus faculty. The project will culminate in a series of detailed reports to the campuses and to the IU Board of Trustees and other statewide policy makers. The project is envisaged as the first step toward actualization of the goals, policies, action, and assessment guidelines developed by faculty teams in each area.

The team working on Community and Public Service has taken as its central tenets the increasing importance of university-based outreach programs to a knowledge society and the growing role to be played by regional campuses as well as research universities in all forms of extension services. These include continuing education, technology transfer, economic development and cultural programming. The expansion of information technologies has greatly increased the range of expertise that such relatively small campuses can command. It has also expanded their ability to gather information, build databases, communicate across campuses and constituencies, deliver educational and cultural programming through different distance learning technologies--and to accomplish these goals "faster, cheaper, better."

Panel presentations proceed through five categories: (1) a general overview of the project and its findings; (2) criteria for excellence in community service; (3) processes for identifying, prioritizing, and decision-making, including a matrix-based approach to community service; (4) examples of technologically-supported community service in action throughout Indiana; and (5) team recommendations for future growth and excellence. The use of information technology is emphasized throughout, as is an emerging new model for professorial activity that engages the faculty member in the educational needs of the community. The "scholarship of service," with its significant dependence on technological literacy, is another recurrent theme.

The Public Service Mission of Regional Campuses:

Indiana University has as its main mission the effective teaching of the men and women who enroll as students in the institution. However, within the past ten years, legislators and other citizens have increasingly insisted that state universities have an obligation to respond to the needs of society and to provide a leadership role toward meeting those needs. Those of us in academia are very aware of the trilogy teaching, research, and service. Teaching and research are easily identified and evaluated. Service, on the other hand, has been less valued and therefore is not relevant to most faculty. There are no inherent rewards to the faculty, and doing service only tends to add more pressure. Faculties are expected to teach better, research more with fewer dollars, and publish, while at the same time, provide excellent service to the regions they serve.

In an attempt to meet all of these expectations, a group of IU faculty met several times, using a variety of technologies, over the period of one year. Essential factors that are critical to successful service were identified as well as variables outside the academy that affect the outcomes of service. The committee was charged to present a definition of regional and community service, review the current state of community service at the campuses, review the national scene to identify outstanding programs, and provide direction for the IU regional campuses by identifying issues, policy implications, and recommendations. The remaining presentations describe the result of our work.

Defining Excellence in Community Service:

The IU Regional Campus Excellence committee defines community service as "mission- driven university activities that involve non-university constituencies in ways that improve the quality of life for the people/region involved." The university and community members engage each other through resource-sharing, partnerships and collaborations, and application of knowledge to regional issues. In each of these three types of activities, technology is used as a tool to make these activities more effective. Technology is effective in: (1) allowing communication about commonalties in service and outreach between the campuses (separated by fairly large distances across the state); and (2) enhancing service activities by a campus throughout a region serving several counties (again to help break down barriers of distance). Criteria for excellence include the linkage of academic goals with regional and community needs. The scholarship of service is emphasized via dynamic interaction of knowledge creation (research), transmission (teaching), and application (service). It is important for cross-campus effectiveness of public service activities that consensus be reached on common issues and that there be consistency in the reward structure for faculty service activities. In a list of assumptions, one point stresses that university service must, among other things, promote a region's effective university-to-community technology transfer.

Matrix Approach to Public Service Data Collection:

Information technology is useful in identifying and categorizing public service activities. Using a matrix approach to data-gathering, committee members took an initial model grid and mapped current regional and community service activities on their campuses. The initial three dimensions were constituents (those served), initiators (campus constituents involved in service), and demographics. Possible constituencies included alumni, business/industry, cultural arts, governmental, not-for-profits, the environmental community, and public education systems. Initiators were listed as student-defined programs (e.g. service learning), faculty-defined (e.g. consulting), and university-defined (e.g. continuing education). Demographics include populations served, priority of service programs, resource allocations and other financial information, public relations value, and other data used to monitor service programs. These initial grids served five purposes: created a database or inventory of existing service programs, established a baseline of activity, identified best practices that could be shared, created a means for communicating services within/across campuses, and developed a beginning way to track programs for assessment, new development, and resource allocation purposes. These products can be used interactively through various points of access through defined fields, can be shared electronically via websites and shared files, and presented to campus constituencies through presentation software.

Applying Technology to Public Service:

Technology is one of a bevy of tools universities have to use in community service activities. The usefulness of the technology depends upon an individual understanding both of the capability of the technology and the situation in which the technology is to be applied. In one case, university faculty saw an opportunity for Indiana furniture manufacturers to export to Japan and worked with the Japanese government as well as federal, state and local officials to develop trade arrangements. The relationships between Indiana companies and their Japanese partners were strengthened by weekly fax communication both ways. More recently communication is by frequent e-mails. In another project the technical capabilities of small high-tech Indiana companies are compiled into a university-maintained database which is run against solicitations of the federal Small Business Innovation Research (SBIR) grant program. Via fax and e-mail, university people assist companies in preparing proposals. Indiana companies have received numerous awards from this program, which has resulted in companies hiring increasing numbers of engineers and scientists. In another situation, the university provided leadership training to local elected officials via video conference to several remote locations. Utilizing technology has helped ratchet up community skill levels and helped make university community service activities more cost-effective.

Conclusion and Recommendations:

Study of community service on IU regional campuses demonstrates that innumerable worthy activities link the five regional campuses to their service areas, communities and beyond. There exists considerable variability within and between campuses relative to the support of community service. The committee emphasized the necessity of discussions regarding the relationship and interdependence of community service and other areas of university life and the paradoxes that need to be understood for the creation and support of a culture of excellence in community service.

Recommendations were developed for the purpose of achieving statewide excellence and national recognition for responsive engagement. The committee endorsed the five core recommendations of the Kellogg Commission regarding public service, which has called upon universities to expand their public service contributions to society. Conclusions specific to the Indiana University regional campuses address campus recommendations, faculty recommendations, and recommendations for the Indiana University system at-large. System recommendations include sharing web-based services and having campuses assume a leadership role in technology services. The vision is for Indiana University's regional campuses to assume a national leadership role in community service.

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Transforming Education Through Information Technologies

Abstract

Category: Papers Presented at EDUCAUSE annual conferences

ID Number: EDU9909

Title: Globalization (A Freshman Seminar): Using Technology to Enable Alumni and Outside Experts to Enrich a Class

Author: Craig E. Runde

Organization: Wake Forest University

Year: 1999

Abstract: Faculty members can enrich their courses by combining student or alumni involvement with innovative uses of technology. This paper explains an approach used at Wake Forest University for implementing technology enhanced learning. The author sought the help of the Alumni Affairs office in recruiting alumni in different countries to participate electronically in the course using a web-based discussion forum. Guest experts were also "brought in" by using video and teleconferences.

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Globalization (A Freshman Seminar)
Using Technology to Enable Alumni and Outside Experts to Enrich a Class

By Craig E. Runde, Wake Forest University

Wake Forest University chooses a theme for each academic year and offers a series of speakers, events and activities centered around the topic. The theme for 1998-99 was Globalization and Diversity and my colleague Dr. Hank Kennedy and I offered a first year seminar on the subject of Globalization and the State.

Our ten students were able to take advantage of that year's on campus programs, but we wanted to do more to broaden the perspectives to which they would be exposed. We sought the help of the Alumni Affairs office in recruiting alumni in different countries to participate electronically in the course using a web-based discussion forum. We also "brought in" guest experts by using video and teleconferences.

Educational Principles

The first year seminar presents the perfect opportunity to move students away from a passive learning model to one that engages them in more active learning roles. We sought to have students be more interactive both orally in classes and in written forms outside of class. We also wanted to create a situation where student interaction wasn't restricted to a couple of in class sessions per week.

Globalization is creating dramatic changes in the world. We wanted students to be able to analyze them from more than just an American perspective and as a consequence we wanted to expose them to thoughts from people in different countries.

Computer Enhanced Techniques Used in the Course

We tried several different technology applications in the course.

1. Web page for course

First, we created a web site for the course using a template design that had been created at the University. The web site was used as a repository for an updated version of the course syllabus and for our class discussion forum. By having the discussion on the web site we enabled alumni and guest participants from outside the university to access it.

2. Asynchronous discussion forum

We used our discussion forum for several different purposes. First, the professors posted questions prior to classes that students were required to answer. Later in the course we began to have students comment on each others answers. This discourse seemed to help stimulate in-class discussion. As soon as class started the professors were able to pick up where the discussion forum left off and delve more deeply into issues. The forum also permitted students to raise their own questions, both of the professors and each other. Our alumni participants who came from Bolivia, England, Czech Republic, Cameroon and the United States were able to access the discussion forum, read and provide feedback on questions and comment on student answers.

3. Videoconferences and teleconferences

During the semester we began to expand on the idea of enabling student interaction with outside participants. We began to use videoconferences and teleconferences to expose students to leading experts in various subjects covered in the course. We relied on Dr. Kennedy's personal contacts and then arranged to have the available for a conference during class hours. The experts would provide an overview of the issues associated with the subject and would then interact with the students via questions and answers. The students seemed particularly attentive during the videoconferences, especially when the guest would call on them with questions.

4. Student web pages

Students were also expected to use technology as part of their class assignments. Their final project was to develop a web site which gave their own impressions about where globalizing trends would lead over the next twenty-five years. At first, the students were a little reticent because they had not had experience building sites. After they finished their assignments they seemed quite proud that they had been able to do it.

Measured Results

Dr. Kennedy has been teaching at Wake Forest for fifteen years and he observed that this had been the most participative group of students he had experienced during that time. Indeed, the in class discussion seemed to pick up in relation to the quality of the out of class interaction on the discussion forum. Student reviews at the end of the course also pointed to the interactive quality of the course as a plus.

Lessons Learned

Soliciting and motivating outside participants

We did not have a convenient way to solicit participation from alumni participants, but were fortunate to receive excellent assistance from Bob Mills in University

Advancement. To enable wider use of alumni an easier method to contact those interested in participating in particular fields would be necessary. The faculty members teaching the course also need to take extra steps to keep the alumni informed about what is happening in the course and how they can contribute.

The alumni do not have the benefit of attending the class and building a rapport with the students, and the faculty members need to communicate effectively with the alumni to keep them interested and provide them with a better sense of how they can contribute.

Interaction outside class contributed to in class interaction

Proper use of the class discussion forum enabled students to think about the issues they would be reviewing in the next class. It also permitted the faculty members to see in advance what perspectives students had on issues, which helped in shaping in-class discussion. Students who were shy about speaking in class were able given another forum where they could contribute.

Addition benefits - contacts and networking

A significant unanticipated outcome was the opportunity for students to begin to network with alumni and other experts. Indeed, we even saw this same phenomenon among the alumni and experts themselves.

Conclusion

Technology can be applied to bring new and wider perspectives into the classroom. Alumni and outside experts can enrich interactions using relatively simple, cost effective communications technologies.

Contact Information:

Craig E. Runde, Director Wake Forest University International Center for Computer Enhanced Learning

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Email: runde@wfu.edu
Webpage: http://www.wfu.edu/~runde (includes links to articles about the course)

This paper will be included in an upcoming book on interactive learning being edited by Dr. David Brown of Wake Forest University.

EDUCAUSE *Information Resources Library*

Transforming Education Through Information Technologies

Abstract

Category: Papers Presented at EDUCAUSE annual conferences

ID Number: EDU9945

Title: Go Boldly Where No University Has Gone Before: The Unintended Impact of Technology

Author: Jill Kidwell

Organization: PricewaterhouseCoopers LLP

Year: 1999

Abstract: Institutions of higher education have begun to adopt a broad range of technologies in their quest for administrative improvement. From large-scale ERP through specialty applications to e-business, the introduction of technology has been accompanied by expectations about presumed efficiencies and service enhancements. In fact, technology has forced higher education to confront many of its operating principles: the basic units of the institution, its distinctiveness from other industries, contracts with employees, governance structures, even the balance of power within the institution. Like many other technological innovations in history -- the stirrup, railroads, and radio -- administrative technologies are having unexpected consequences that will transform educational institutions.

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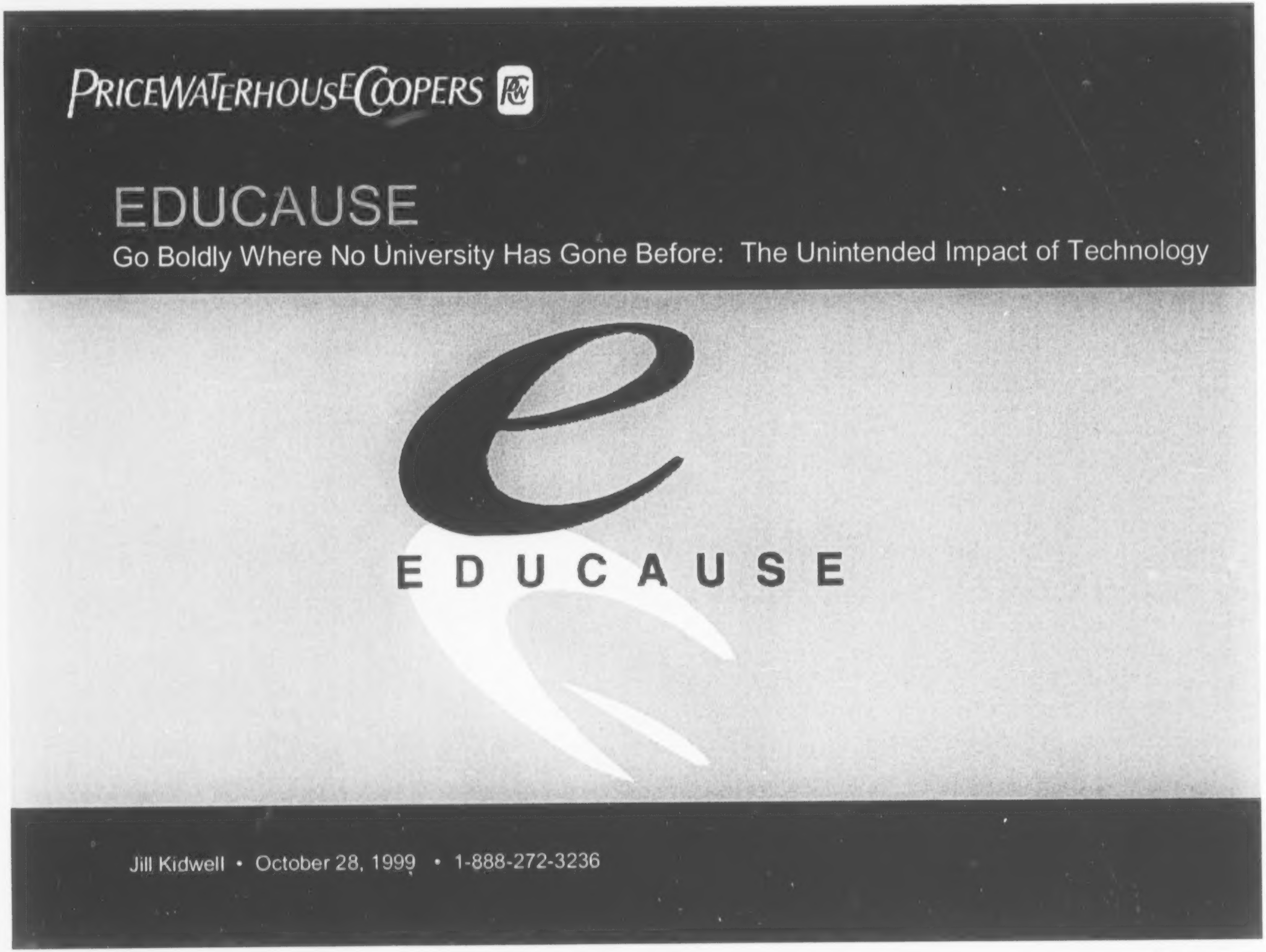

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EDUCAUSE

Go Boldly Where No University Has Gone Before: The Unintended Impact of Technology

EDUCAUSE

Jill Kidwell • October 28, 1999 • 1-888-272-3236

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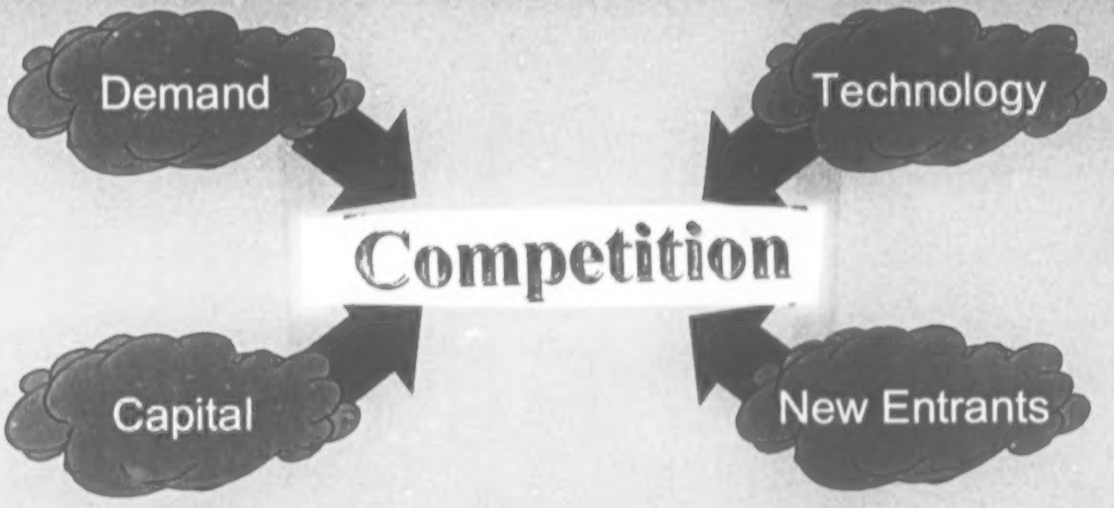
Today's agenda

1. Synopsis of four drivers creating market uncertainty
2. Review of e-business framework to provided a structured way to think about the market
3. Deriving lessons from examples of disruptive technologies in other industries
4. Strategies for the future

New technologies are potentially disruptive, unless their consequences are understood at the outset

Higher education is undergoing dramatic change



Demand

Technology

Competition

Capital

New Entrants

These trends are challenging the traditional models of education

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Knowledge economy escalates demand

Our knowledge economy fuels the need for lifelong learning

- The shelf-life of a degree is shrinking
- Pay gap is widening
- Number of skilled jobs rising, and yet...
  - 42 million adults are functionally illiterate
  - Only 21% of Americans over age 25 have a bachelor's degree or better
- The employment "contract" no longer exists, driving more people to enhance skills to facilitate career switching
- Potential international demand is huge. For every hundred people on the planet, only one has a college education.

Source: Various

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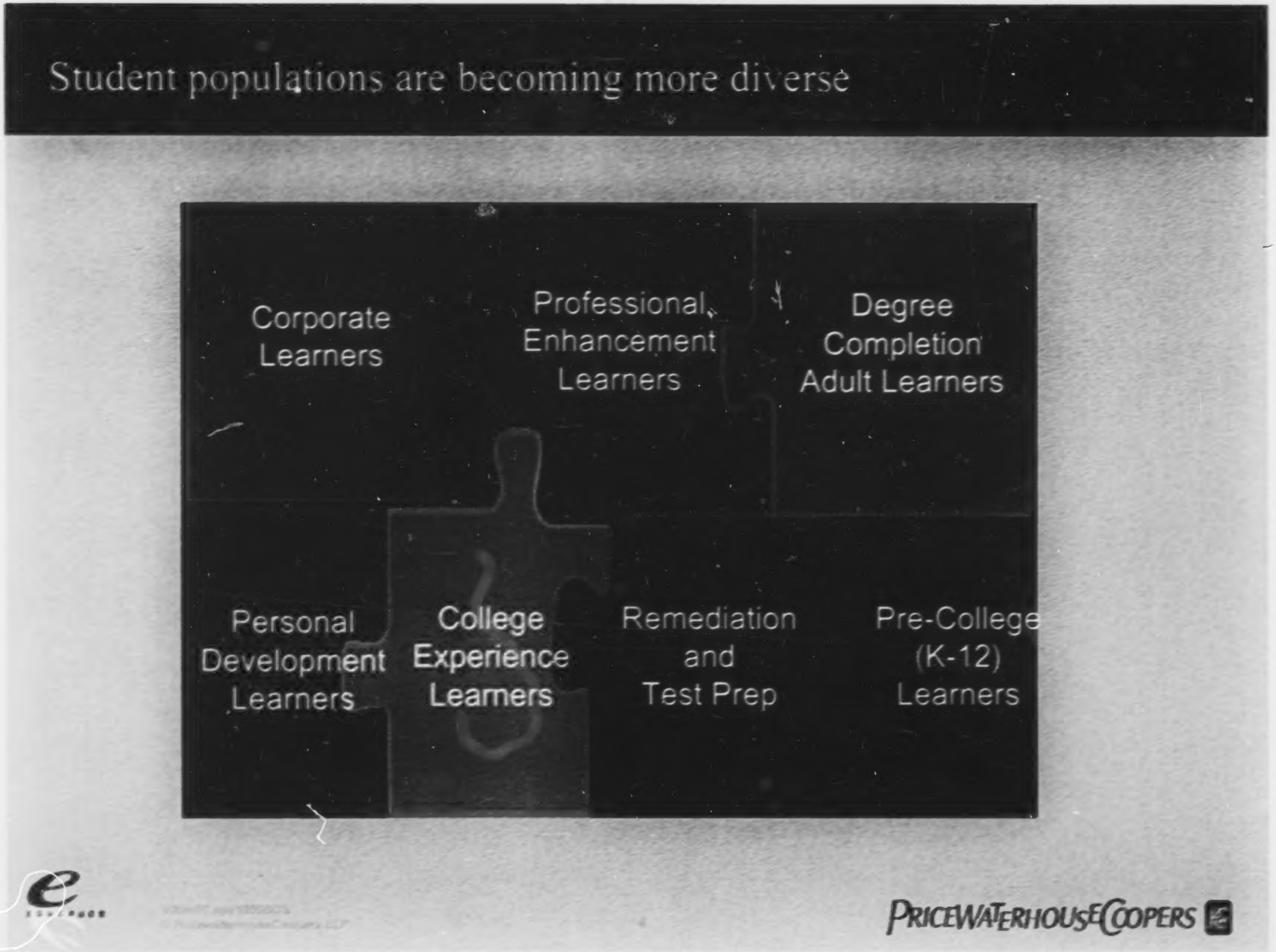

Student populations are becoming more diverse

Corporate Learners

Professional Enhancement Learners

Degree Completion Adult Learners

Personal Development Learners

College Experience Learners

Remediation and Test Prep

Pre-College (K-12) Learners

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Now, technology is enabling disruptive models

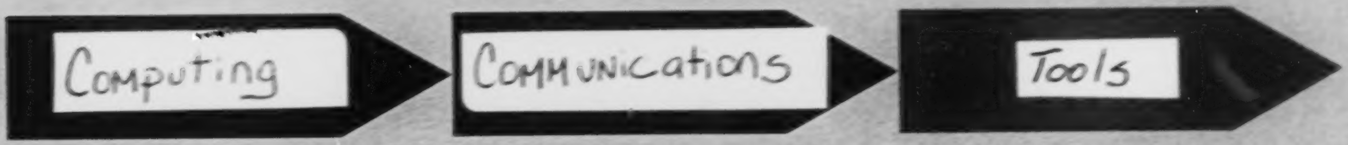
Increasing power of microprocessors enables software solutions to bandwidth constraints, e.g., compression

Broadband is coming. The technologies that will make fast consumer access to the Internet possible:

- cable modems
- xDSL
- wireless

Tools are maturing

- streaming audio and video



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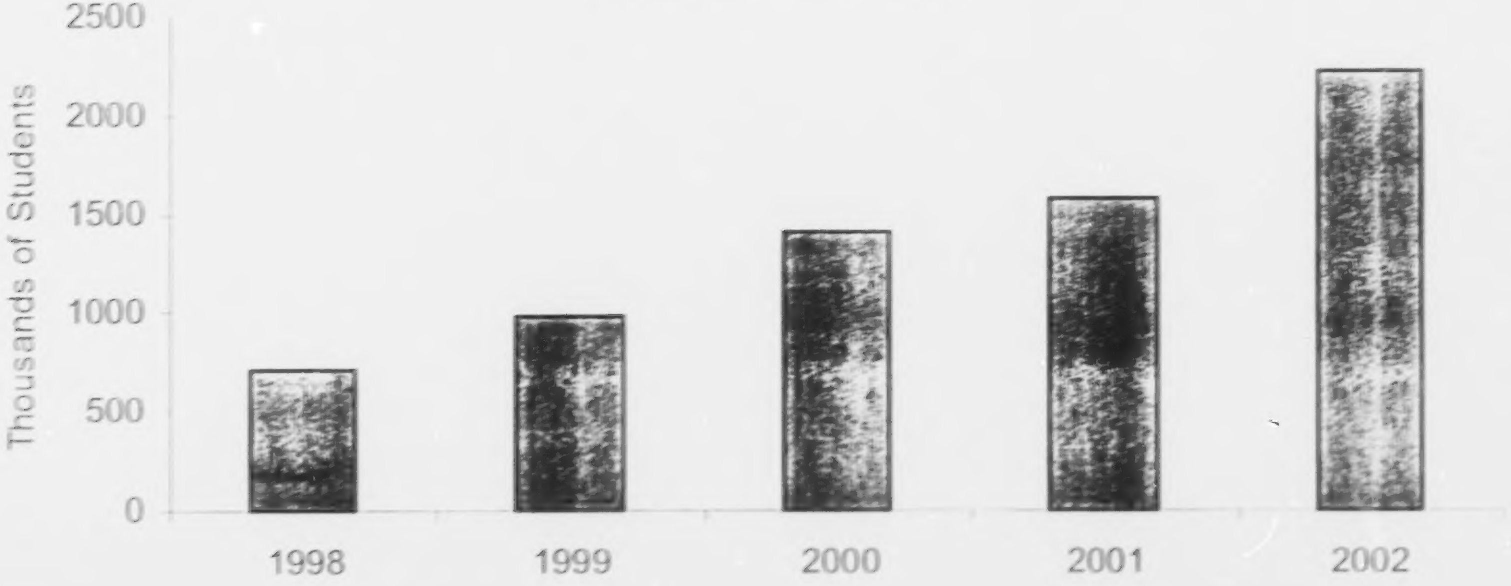
Technology enables high growth in distance education



Students Enrolling in Higher Education Distance Learning Courses, 1998-2002

Source: International Data Corporation

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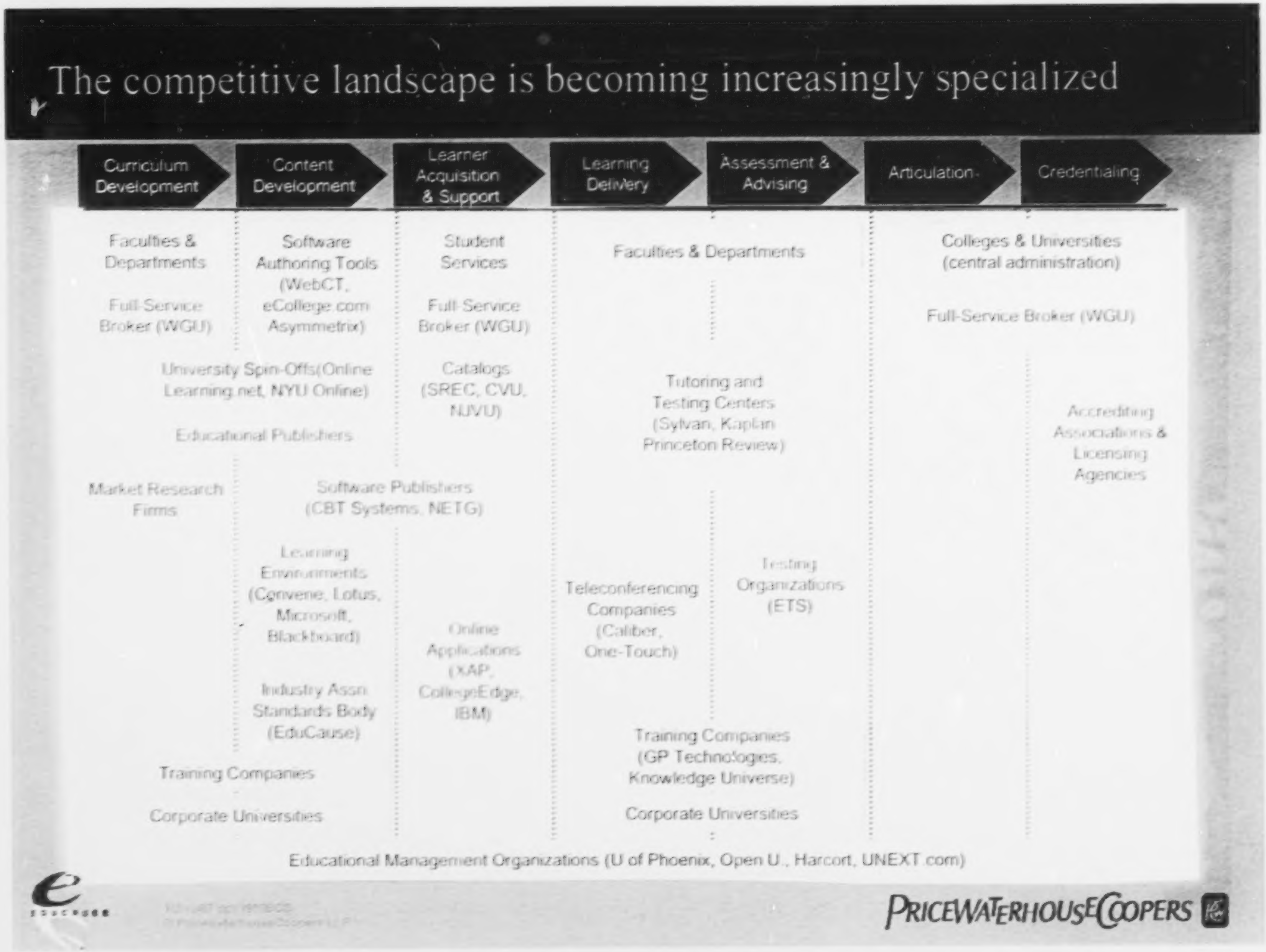

The competitive landscape is becoming increasingly specialized

Curriculum Development → Content Development → Learner Acquisition & Support → Learning Delivery → Assessment & Advising → Articulation → Credentialing

Curriculum Development
- Faculties & Departments
- Full-Service Broker (WGU)
- Market Research Firms

Content Development
- Software Authoring Tools (WebCT, eCollege.com Asymmetrix)
- Learning Environments (Convene, Lotus, Microsoft, Blackboard)
- Industry Assn. Standards Body (EduCause)

Curriculum Development / Content Development
- University Spin-Offs(Online Learning.net, NYU Online)
- Educational Publishers
- Training Companies
- Corporate Universities

Content Development / Learner Acquisition & Support
- Software Publishers (CBT Systems, NETG)

Learner Acquisition & Support
- Student Services
- Full-Service Broker (WGU)
- Catalogs (SREC, CVU, NJVU)
- Online Applications (XAP, CollegeEdge, IBM)

Learning Delivery / Assessment & Advising
- Faculties & Departments
- Tutoring and Testing Centers (Sylvan, Kaplan Princeton Review)
- Training Companies (GP Technologies, Knowledge Universe)
- Corporate Universities

Learning Delivery
- Teleconferencing Companies (Caliber, One-Touch)

Assessment & Advising
- Testing Organizations (ETS)

Articulation / Credentialing
- Colleges & Universities (central administration)
- Full-Service Broker (WGU)

Credentialing
- Accrediting Associations & Licensing Agencies

Educational Management Organizations (U of Phoenix, Open U., Harcort, UNEXT.com)

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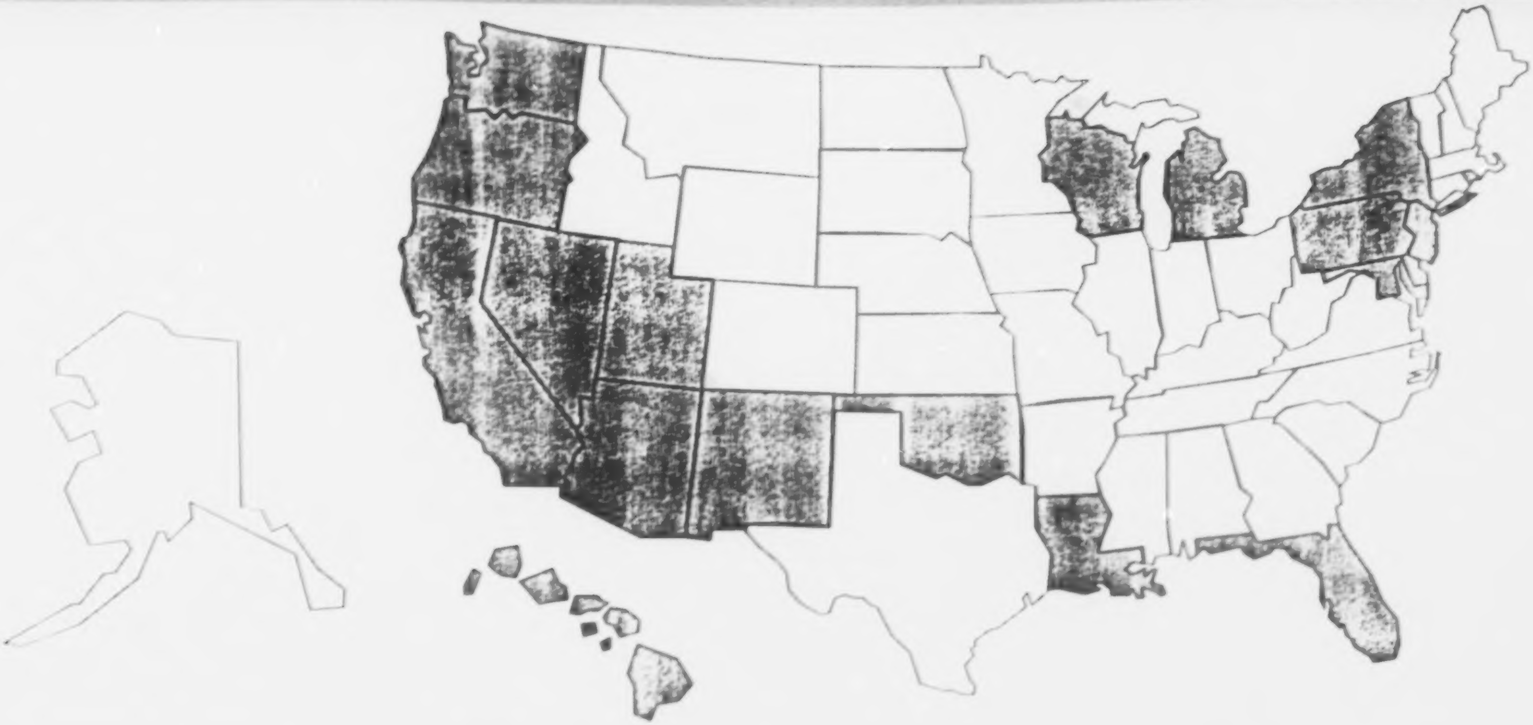
Here comes Phoenix...



Source: Chronicle of Higher Education, 10/23/98, University of Phoenix

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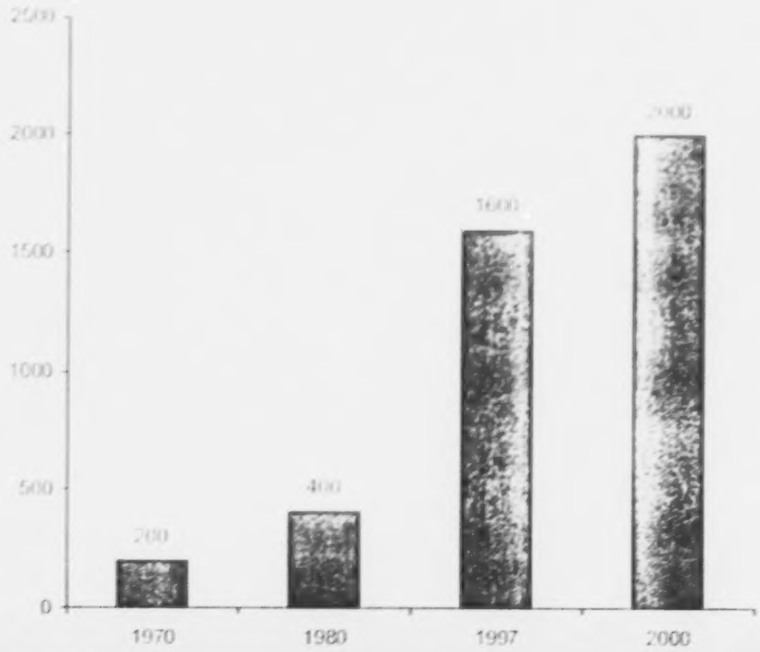
Increasing competition from corporations

Competition is coming from unlikely sources such as corporations who invest heavily in their employees' education.

Corporate Universities Up 10-Fold in 30 Years



11% of Fortune 500 companies have Chief Knowledge Officers

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Even your colleagues are competing against you in new ways

Caliber Learning Systems has partnered with:

- Columbia University
- Georgetown University
- John Hopkins University
- University of Pennsylvania
- University of Southern California

caliber

UNEXT.com has partnered with:

- Carnegie Mellon University
- Columbia Business School
- London School of Economics
- Stanford University
- University of Chicago

unext.com

Pensare has partnered with:

- Duke's Fuqua School of Business

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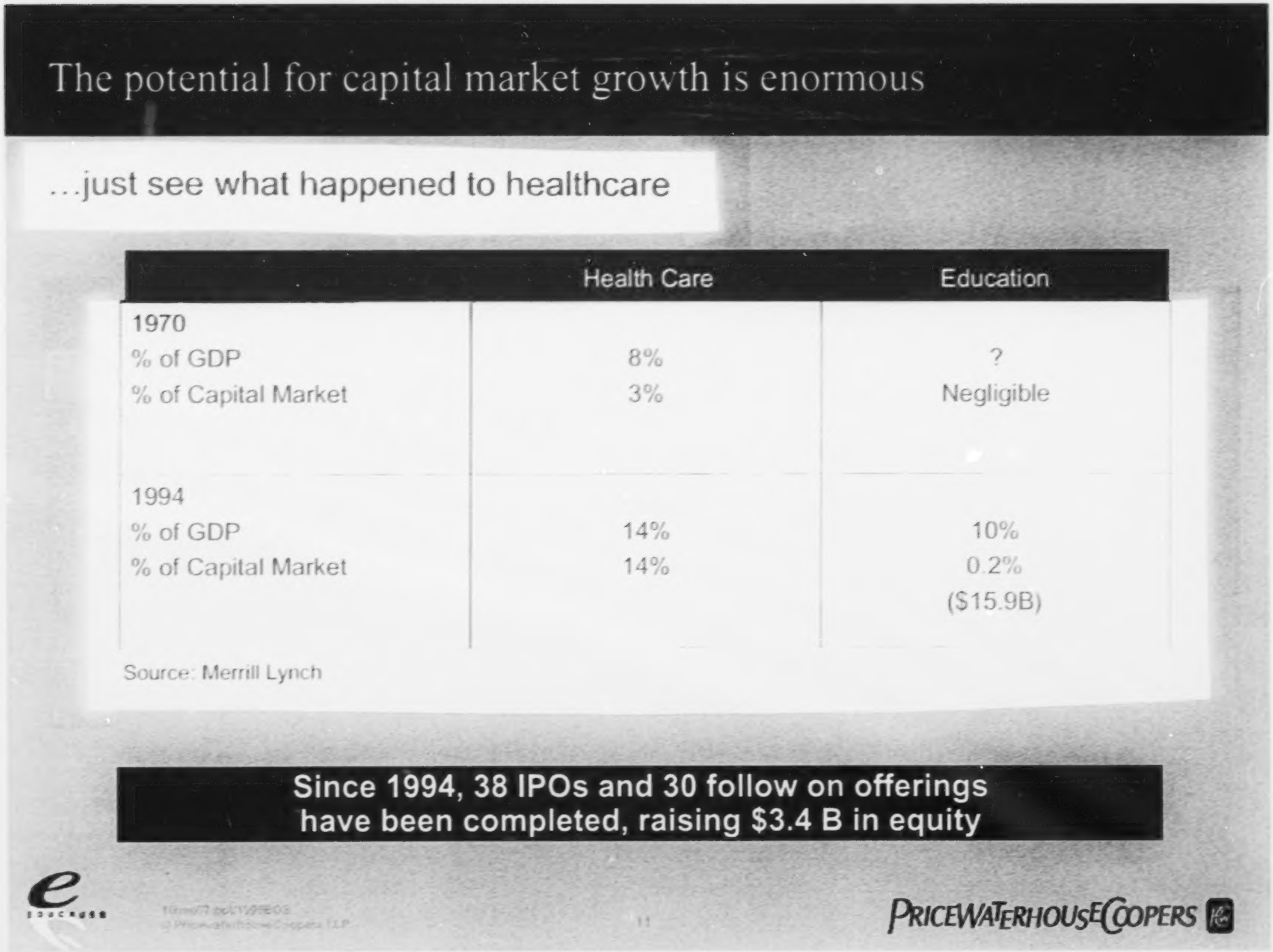

The potential for capital market growth is enormous

…just see what happened to healthcare

	Health Care	Education
1970		
% of GDP	8%	?
% of Capital Market	3%	Negligible
1994		
% of GDP	14%	10%
% of Capital Market	14%	0.2% ($15.9B)

Source: Merrill Lynch

Since 1994, 38 IPOs and 30 follow on offerings have been completed, raising $3.4 B in equity

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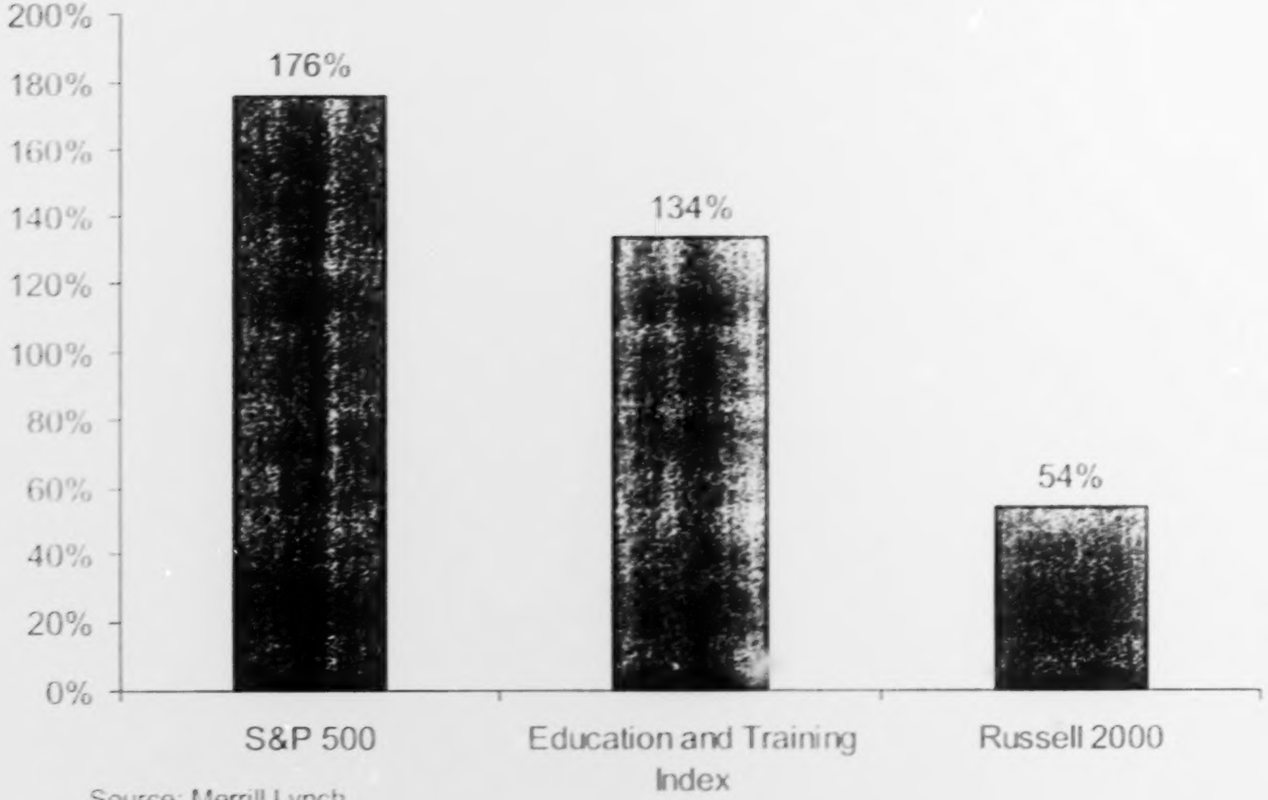
Capital markets are responding the unmet demand!



Source: Merrill Lynch

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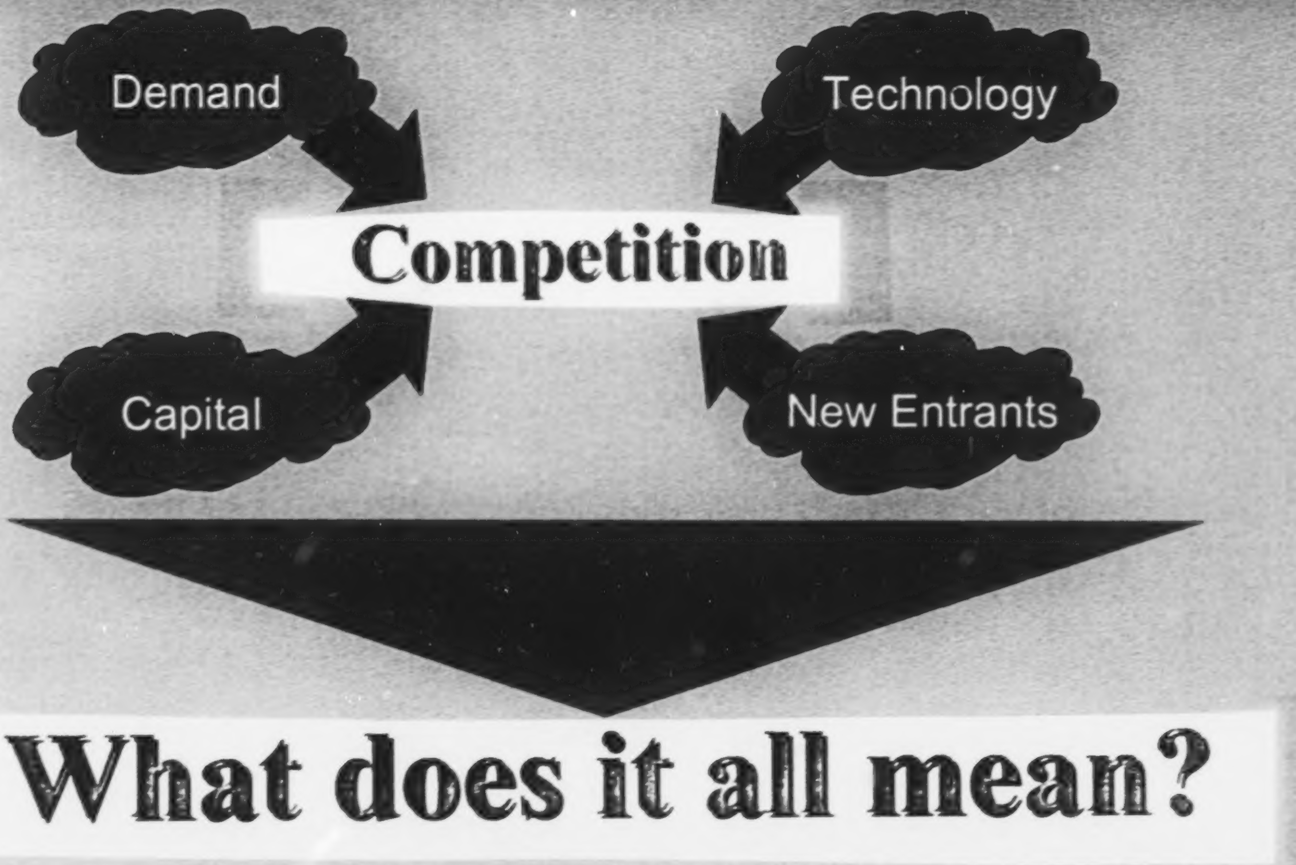
Higher education is undergoing dramatic change



Demand

Technology

Competition

Capital

New Entrants

What does it all mean?

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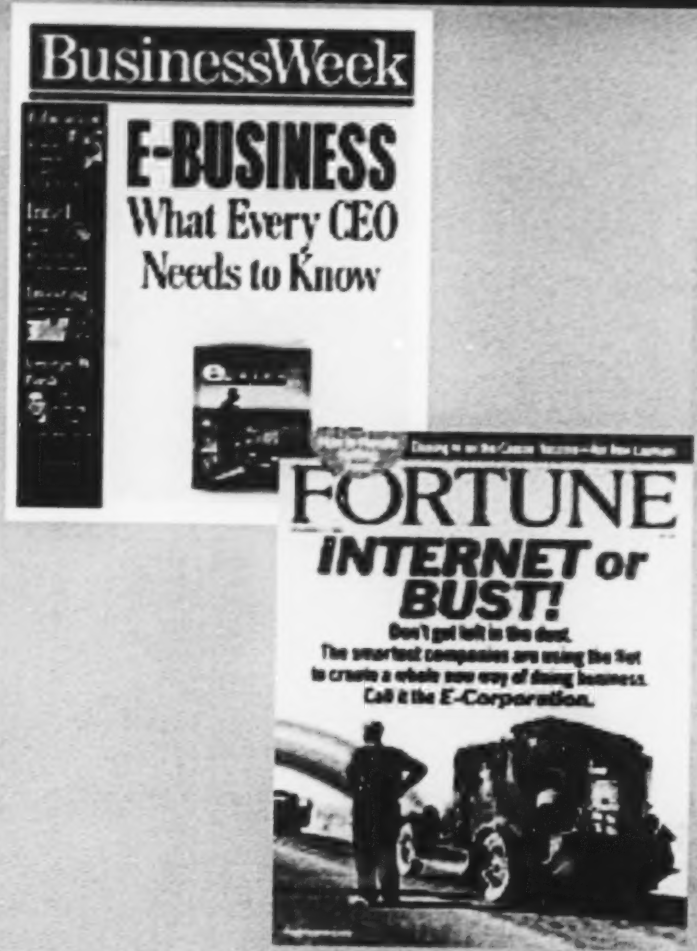
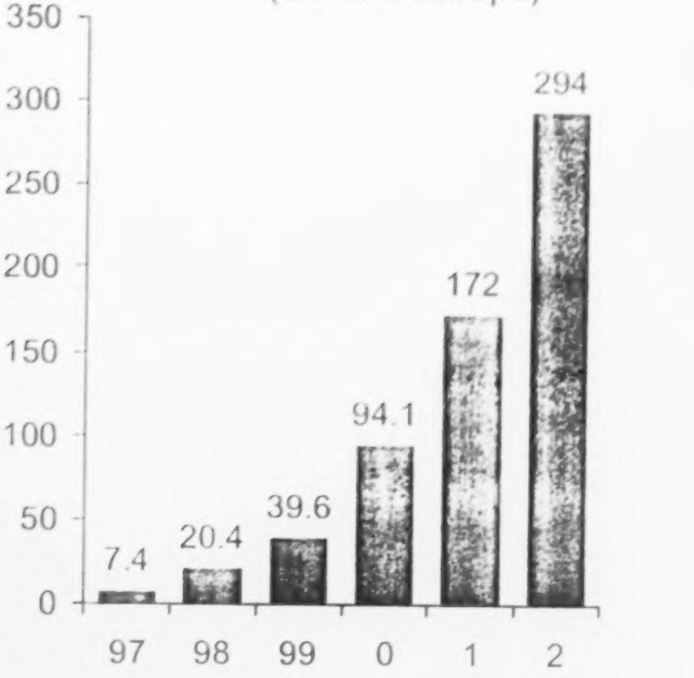
It's E-Business and it's here


BusinessWeek
E-BUSINESS
What Every CEO Needs to Know
FORTUNE
INTERNET or BUST!
Don't get left in the dust.
The smartest companies are using the Net to create a whole new way of doing business.
Call it the E-Corporation.

E-Business Transaction Value ($B)
(US and Europe)



Source: eStats online

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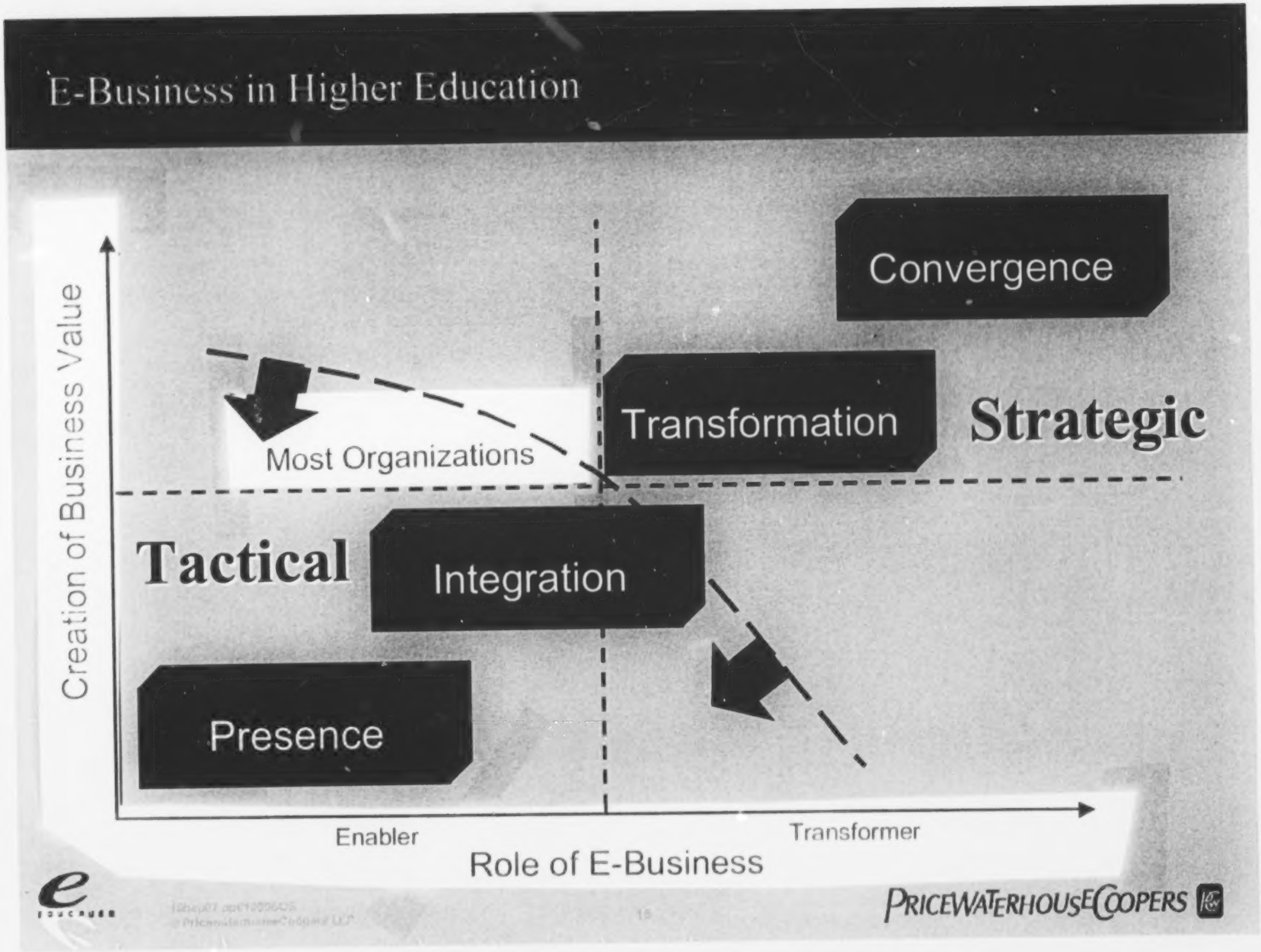

E-Business in Higher Education

Creation of Business Value
Convergence
Transformation
Strategic
Most Organizations
Tactical
Integration
Presence
Enabler
Transformer
Role of E-Business

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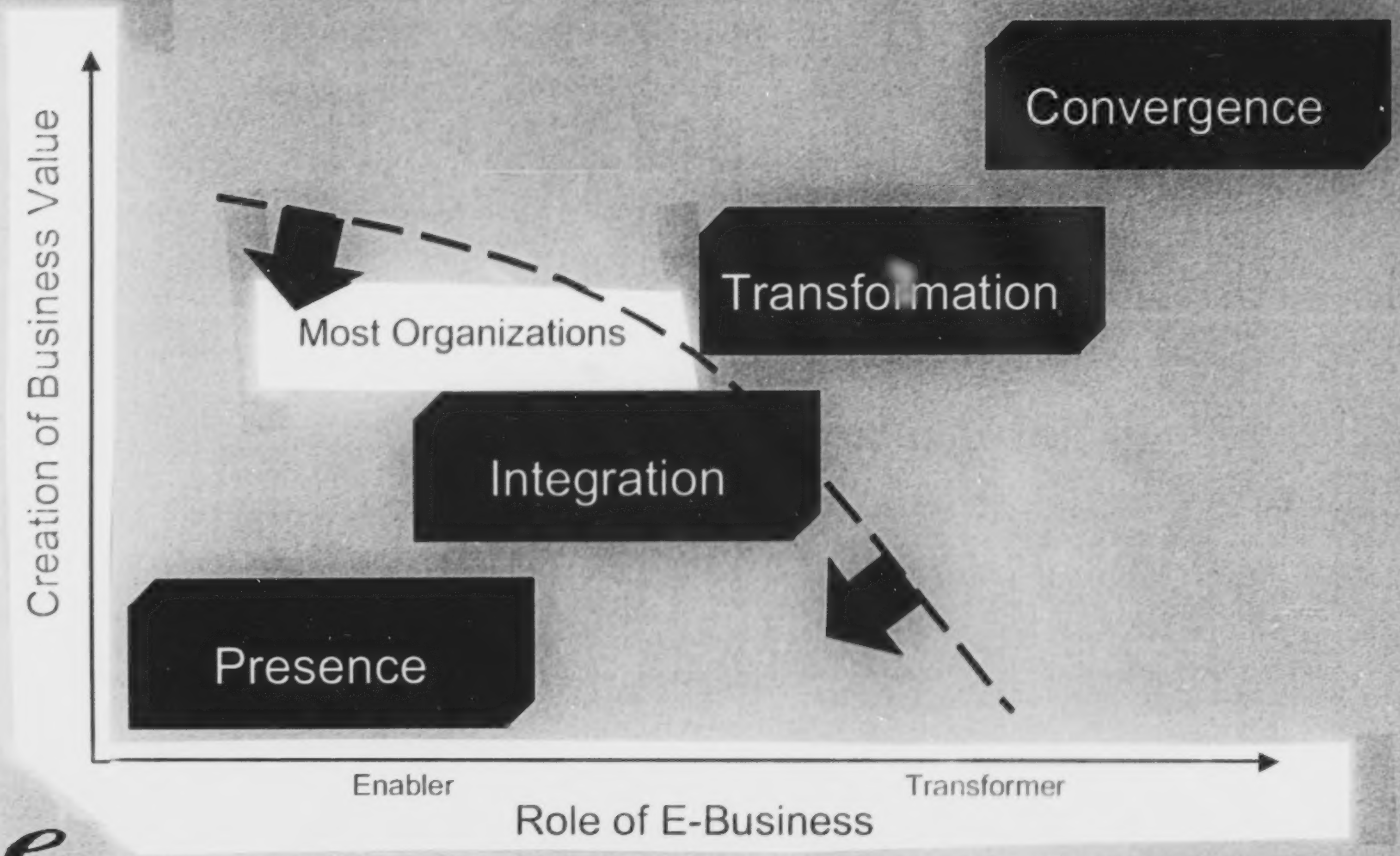
Phase I: Presence


Convergence
Transformation
Most Organizations
Integration
Presence
Creation of Business Value
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Transformer
Role of E-Business

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Phase I: Presence

Drivers

- Every one is doing it

Examples

Purchasing
- Online description of purchasing procedures

Student Services
- Online catalog of University information

Learning
- Online syllabi and course information

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Phase I: Presence

Benefits of "presence"

- Better informed customer
- Learned a lot about the Web

Unintended consequences

- Projects have low ROI
- Limited successes, popularity
- Projects remain isolated instances, rather than broad scale application
- Can lead to customer disappointment

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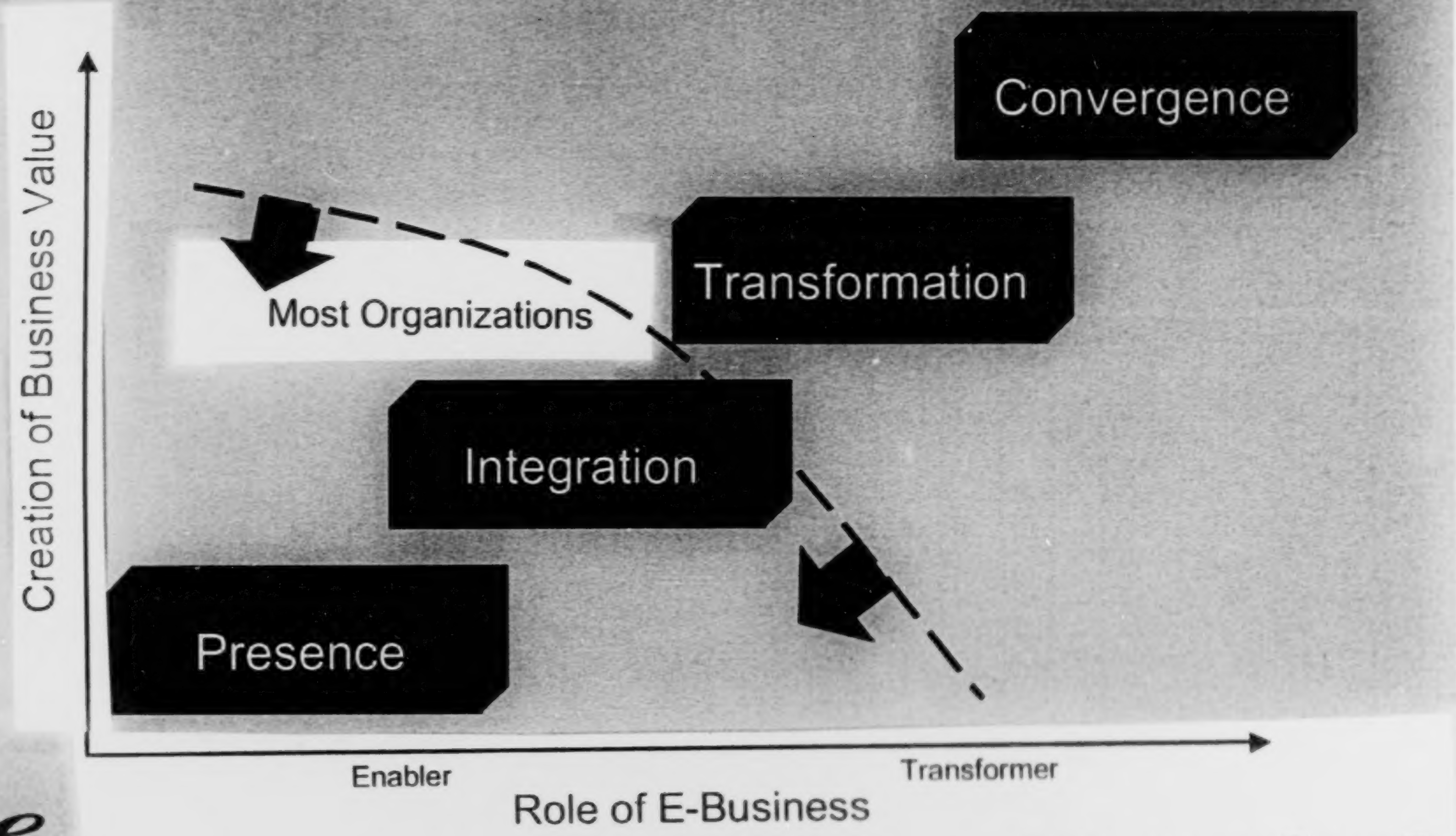
Phase II: Integration


Creation of Business Value
Convergence
Transformation
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Enabler
Transformer
Role of E-Business

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Phase II: Integration

Key drivers

- Do transactions -- real business
- Customer is taking control of the relationship
- Competition (with dot.coms and traditional competitors)
- Perception of cost benefit
- Get more money through extended reach. Really?

Examples

Purchasing

- E-Procurement

Student Services

- Web-enabled student services

Learning

- Distance education courses integrated with financial aid, online content, etc.

COMMERCE ONE

pipeline

EMBARK.COM

eCollege.com

[illegible]
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Phase II: Integration

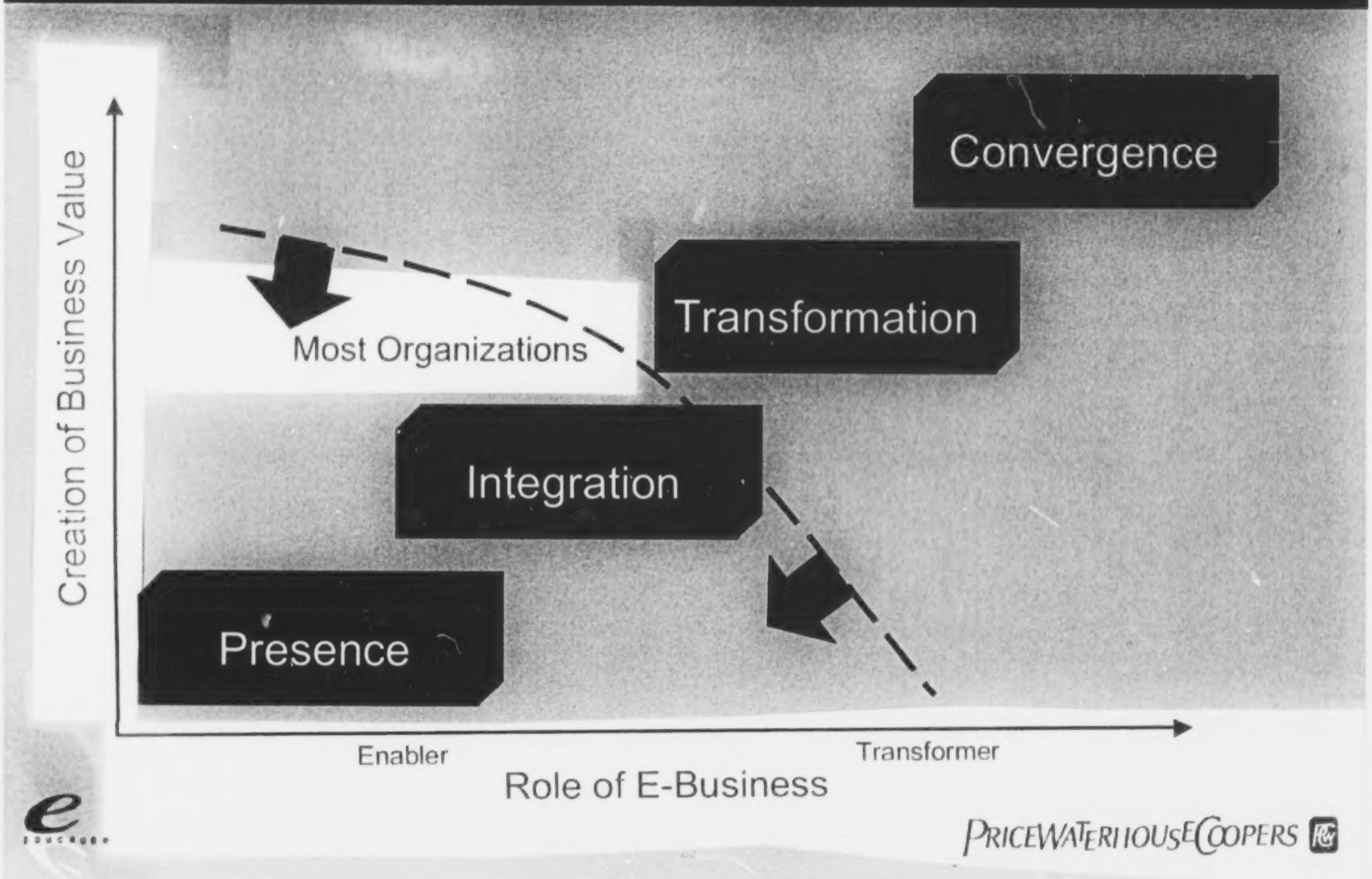
Benefits of “Integration”

- Channel enhancement
- Increase service offering
- Reduce costs through closer relationships with partners and customer self-service
- Better customer information

Unintended consequences

- Channel conflict
- Higher than anticipated IT investment—across the value chain
- Lack of integration
- Not able to scale up to demand—lose user base
- Front office needs revamping
- Partnerships are challenging to manage

Phase III: Transformation



Convergence

Transformation

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Phase III: Transformation

Key drivers

- Defensive reaction to dot.com
- You know the customer so well, that you can anticipate needs
- 1:1
- Technology is here
- World is moving to real time, interactive, multimedia

Examples

Purchasing

- Full value procurement
- Just in time
- Eliminate WIP
- Event-driven fulfillment

Student Services

- Anticipate loan demand
- Anticipate graduation
- Anticipate future learning needs

Learning

- Educational paradigm shifts from "teacher-centric" to "learner-centric."

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Phase III: Transformation

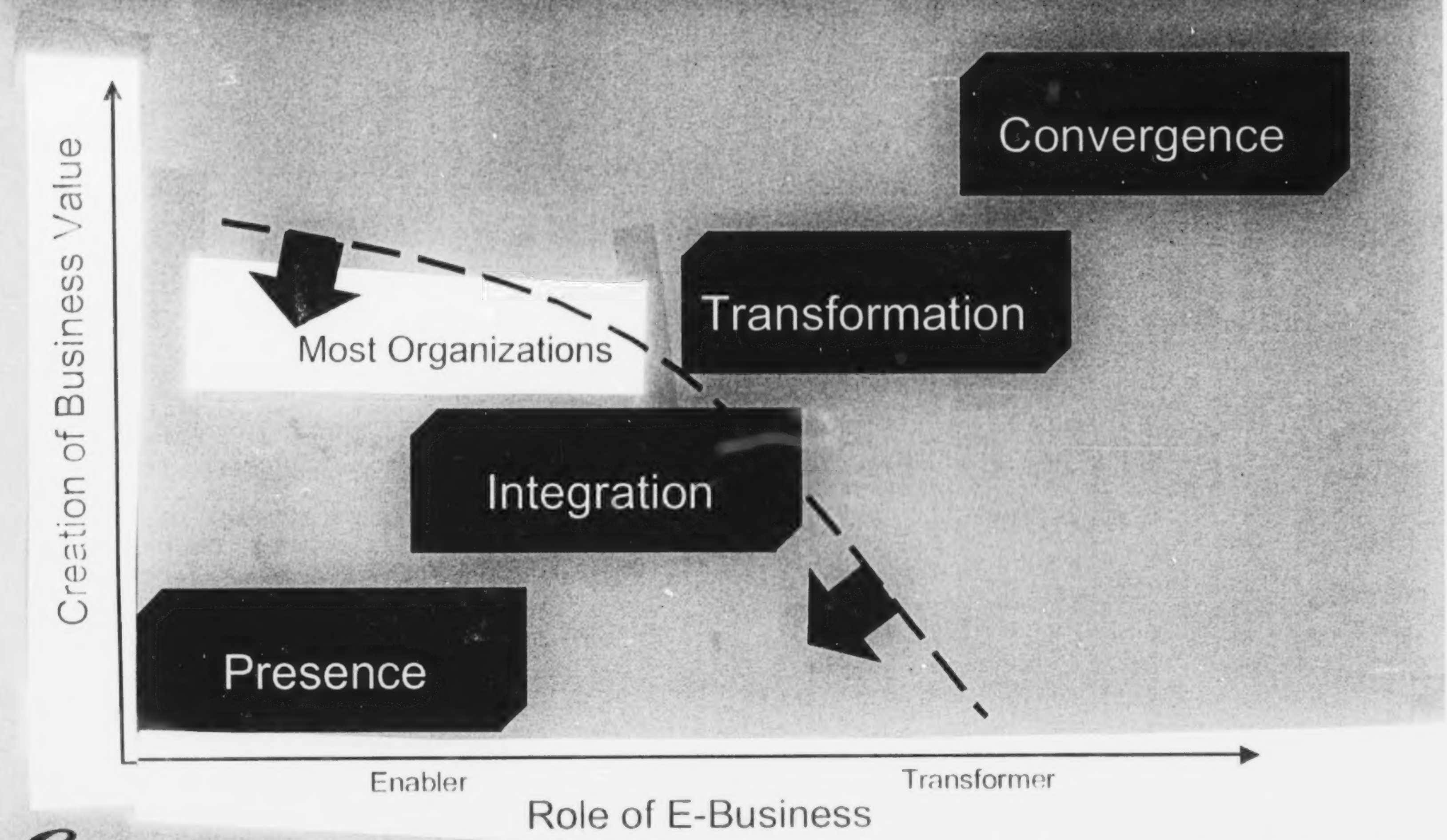
Benefits of “transformation”

- Potential market dominance
- Lock-in customers and suppliers
- First mover advantage

Unintended consequences

- No one is safe
- Consolidation will happen
  - acquisition & exit
- Challenges institutional mission
- New entrants challenge existing incumbents

Phase IV: Convergence



Creation of Business Value

Convergence

Transformation

Most Organizations

Integration

Presence

Enabler

Transformer

Role of E-Business

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Phase IV: Convergence

Key drivers

- More of the same
- ???????

Examples

- Competing eco systems
- So married into the process chain that the business model as we know it today is gone

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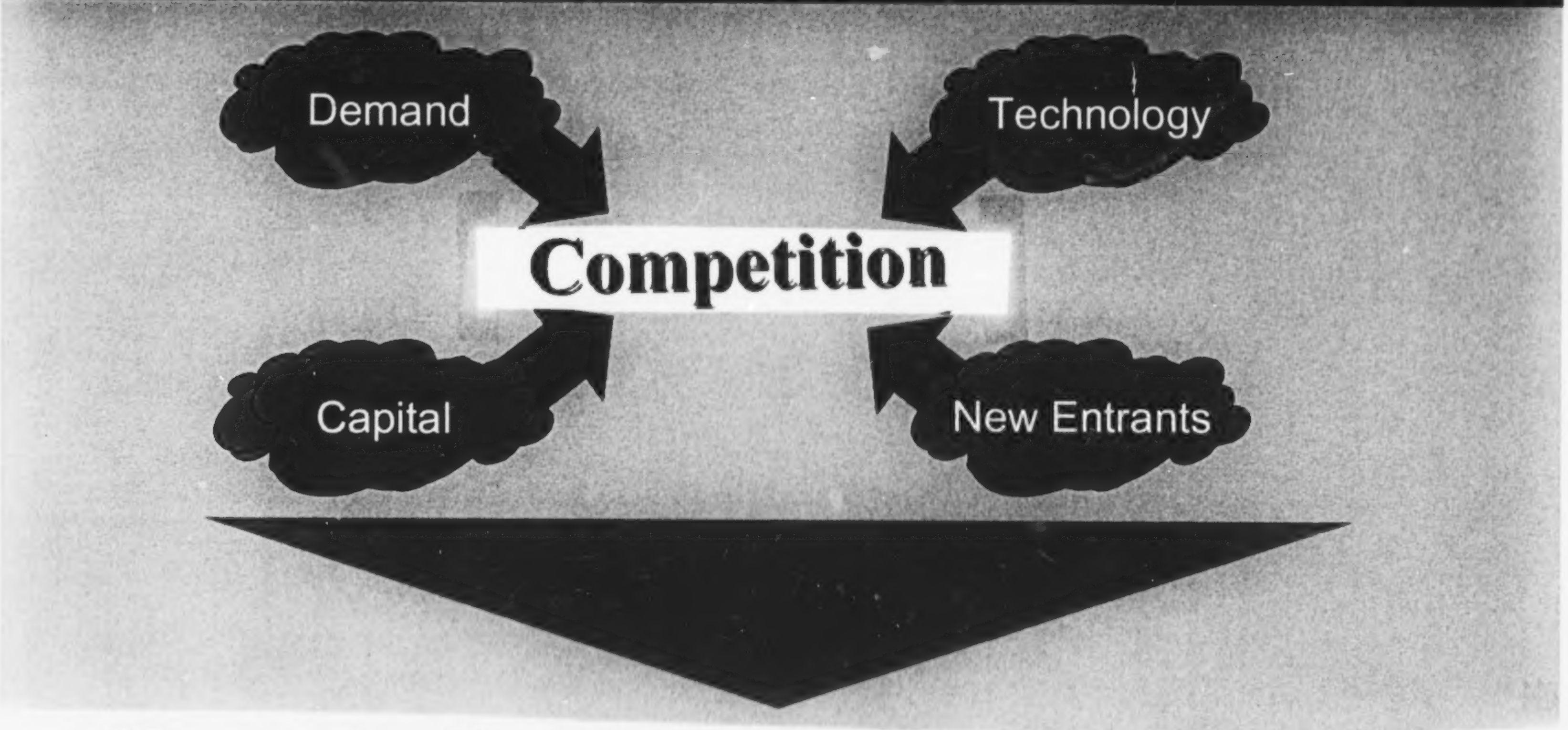
Higher education is undergoing dramatic change



Demand

Technology

Competition

Capital

New Entrants

How do I prepare for the future?

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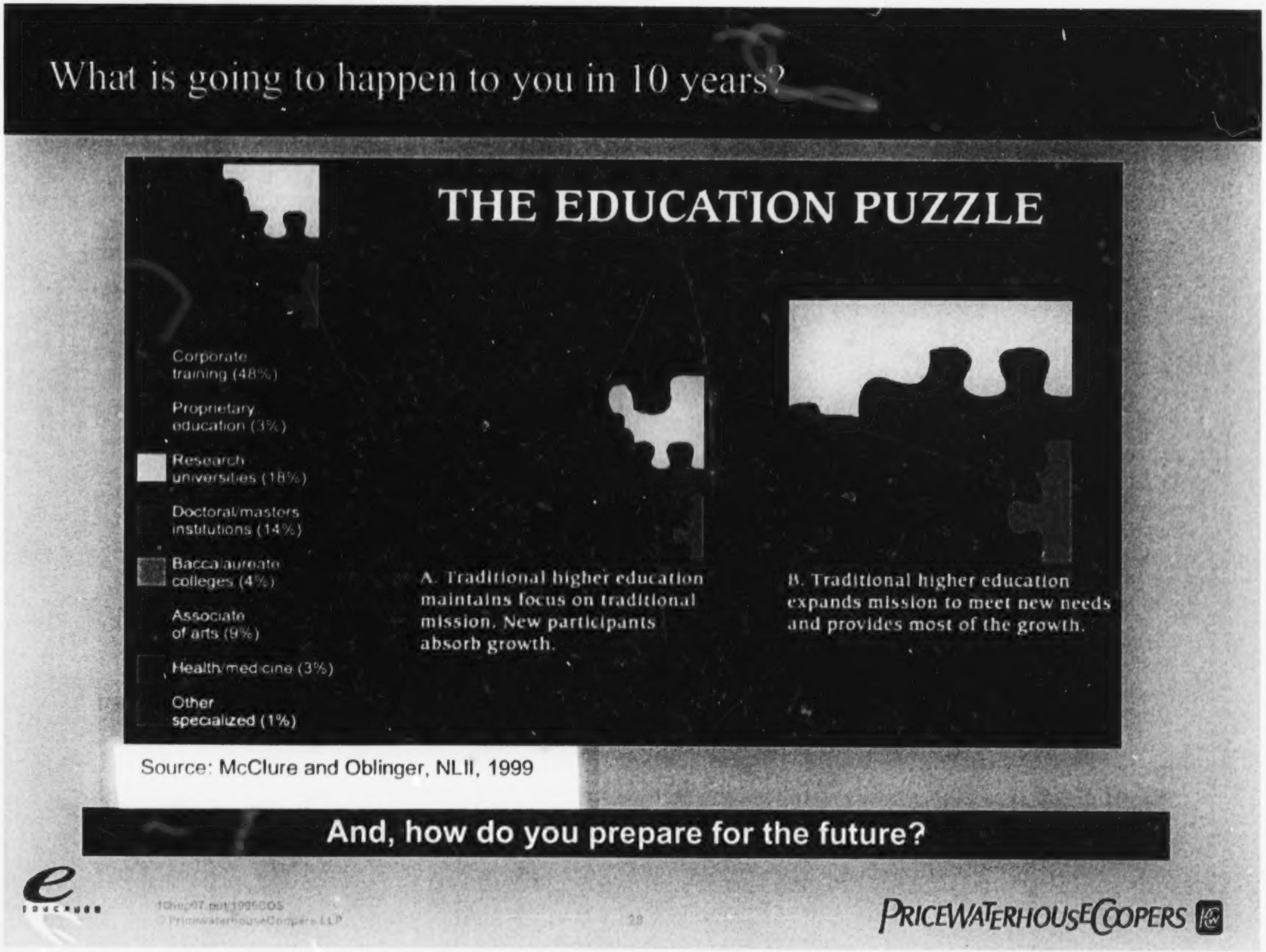

What is going to happen to you in 10 years?

THE EDUCATION PUZZLE

- Corporate training (48%)
- Proprietary education (3%)
- Research universities (18%)
- Doctoral/masters institutions (14%)
- Baccalaureate colleges (4%)
- Associate of arts (9%)
- Health/medicine (3%)
- Other specialized (1%)

A. Traditional higher education maintains focus on traditional mission. New participants absorb growth.

B. Traditional higher education expands mission to meet new needs and provides most of the growth.

Source: McClure and Oblinger, NLII, 1999

And, how do you prepare for the future?

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241

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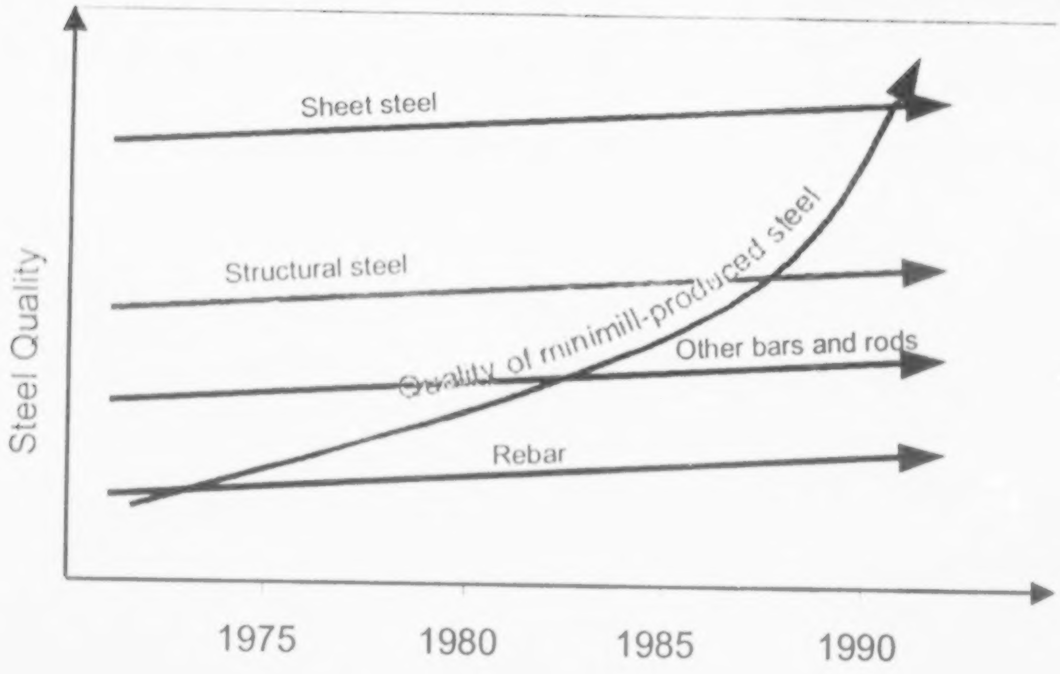
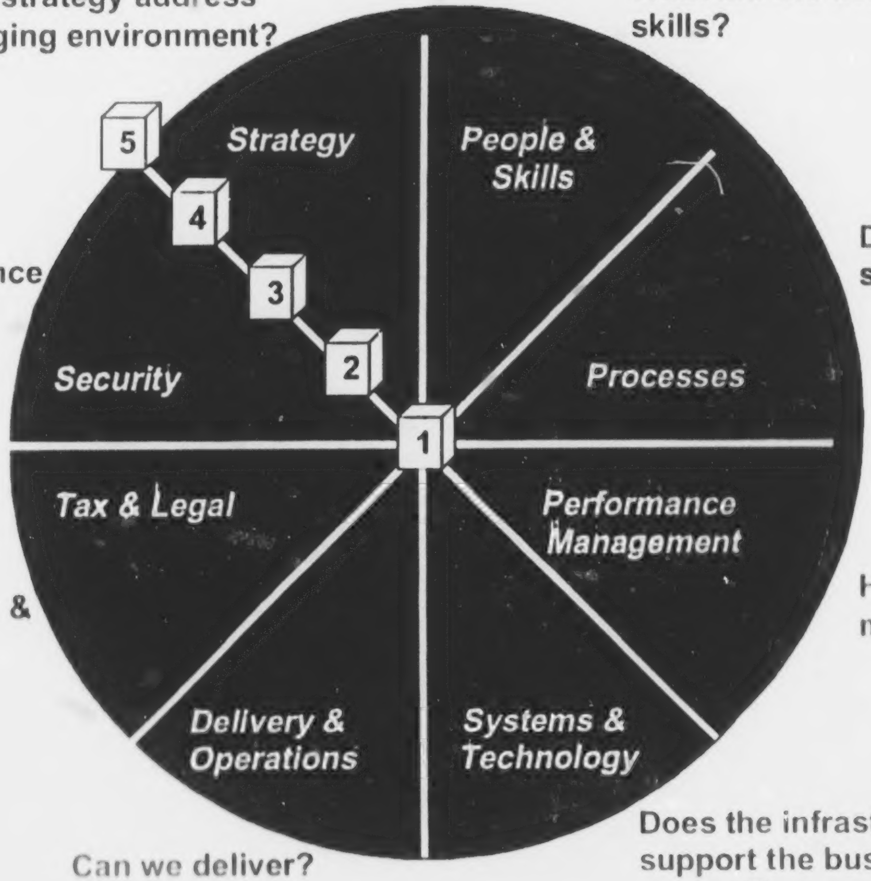
The progress of disruptive minimill steel technology



Source: The Innovator's Dilemma

Are there lessons for higher education?

Structure to avoid unintended consequences



Strategy

People & Skills

Processes

Performance Management

Systems & Technology

Delivery & Operations

Tax & Legal

Security

Does the strategy address the emerging environment?

What are the available skills?

Do the processes support the strategy?

How is performance measured?

Does the infrastructure support the business?

Can we deliver?

What are the tax & legal issues?

What is our competence in security?

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Some cautionary notes to incumbents...

- Know what you want to do, where you want to play
- First mover advantage is huge, but is risky
- Speed is of the essence, but so is a well-conceived strategy
- Consolidation is coming and the middle will increasingly be “squeezed”
- Alliances are a necessity
- Goldman Sachs view—
  - Go to where you can get money
  - If you have a great idea, get it out of the institution, to catch the attention of Wall Street
- Above all, Step Boldly, Go Where No University Has Gone !!!!

Strategy is a process not a project

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Final note

And remember:

“Everyone is potentially vulnerable…
It’s just a matter of timing”

J. Yaremchuck
VentureOne

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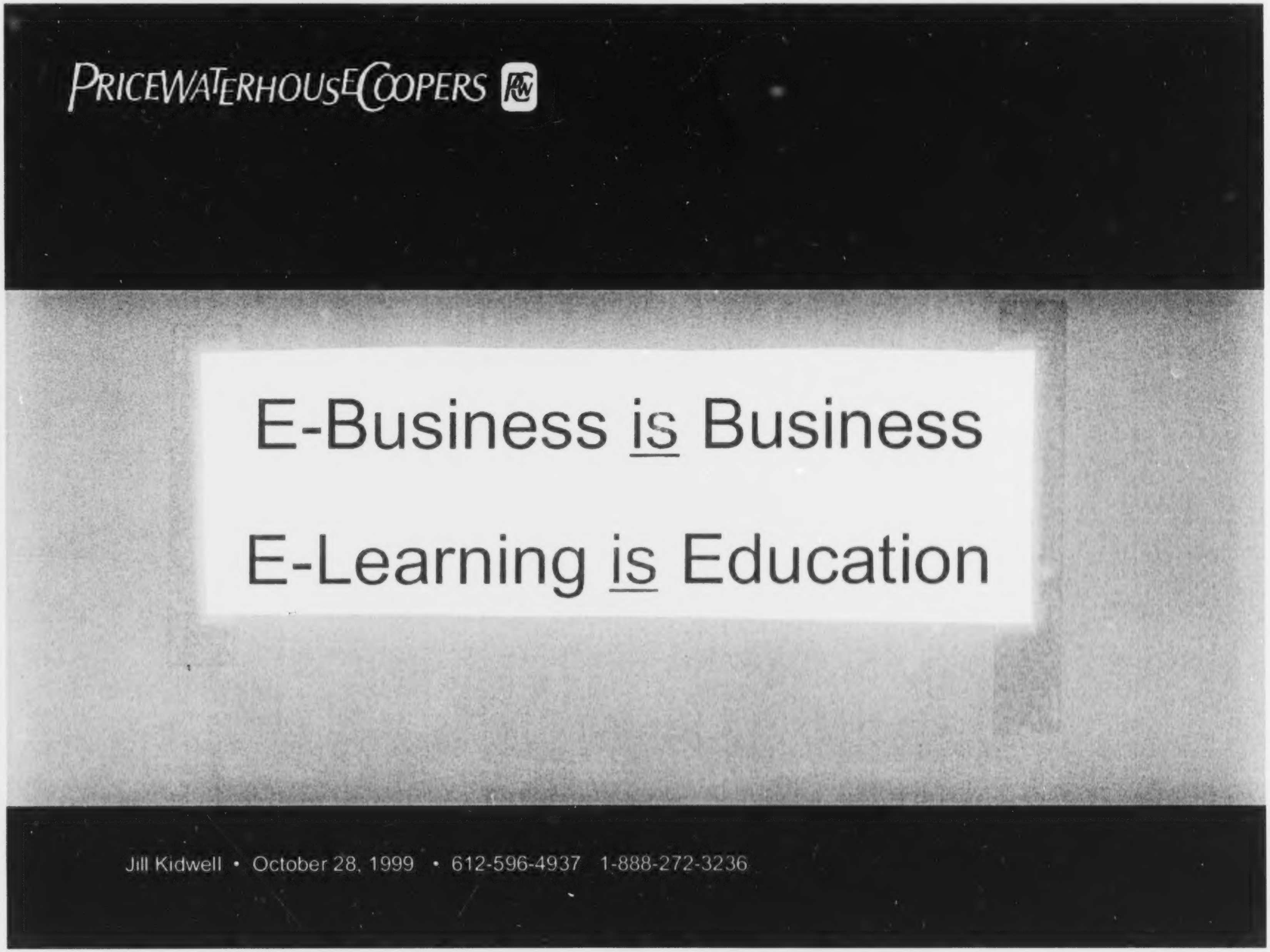

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E-Business is Business

E-Learning is Education

Jill Kidwell • October 28, 1999 • 612-596-4937 1-888-272-3236

EDUCAUSE *Information Resources Library*

Transforming Education Through Information Technologies

Abstract

Category: Papers Presented at EDUCAUSE annual conferences

ID Number:	EDU9903
Title:	How Did He Get to See That? Authorization on the Web
Author:	Albert Steiner
Organization:	Northwestern University
Year:	1999
Abstract:	A web authorization attribute management system permits delegating web service authorization to persons throughout the university. Some authorized services include, viewing of students grades, accessing commercial software, accessing library external databases from off campus, sending bulk electronic mail to a "dynamic" list of persons, classes, school faculty etc. This authorization is built on a NetID (Network Identifier) authentication available to every member of the university community. Much management of network accounts is delegated to schools.

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How did he get to see that? Authorization on the Web. Delegating authorization.

Presentation: Wed 10/22/1999 3:45PM, Educause'99

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A web authorization attribute management system permits delegating web service authorization to persons throughout the university. Some authorized services include, viewing of students grades, accessing commercial software, accessing library external databases from off campus, sending bulk electronic mail to a "dynamic" list of persons, classes, school faculty etc. This authorization is built on a NetID (Network Identifier) authentication available to every member of the university community. Much management of network accounts is delegated to schools.

A more recent version of this report is available at: http://charlotte.at.nwu.edu/asteiner/educause99.html

Northwestern University started web authorization with student access to their own grades as part of the "Mandarin Consortium". Students used usernames called NetIDs (network identifiers) for getting grades and for accessing their email. Gradually the power of this NetID was expanded to the authorizations agents of a dean to send bulk-email restricted to students and staff of that school. The granting of new passwords for NetIDs was also delegated to certain schools. The SNAP (Simple Network Account Process) also controls creation of accounts on about 20 UNIX and NT hosts. The passwords for all of these hosts are synchronized, (users have the same username and password). Users get accounts on specific machines depending on authorization attributes. A proxy authorization process also allows authorized NetIDs to access library outside vendor databases when using IP addresses outside Northwestern University domain.

The infrastructure to manage these resources requires authentication, authorization and an authorization delegation system. Most of the resources are accessed via the web. The management of these resources is done entirely through the web using delegated authorization. Initially, most account authorization was contained in a flat file that I personally needed to edit for each change. The web management system was created to allow authorization decisions to be delegated to other NetIDs in a way consistent with other authority delegation within at Northwestern University.

The "trust" value of authorization must always be considered. Authentication and authorization at a university represent some form of contract usually between a person and an organization. Student authorization is based on the student enrollment and its relationship. Employee authorization is based on the employment relationship. Note that an authentication/authorization may not be as strong as the relationship. E.G., students can see their grades, but at Northwestern University, they do not take tests based on network authentication, because there are too many ways to deceive the authentication. A student could give his NetID password to another person who would fill in the test answers for him.

Web authorization is done mostly by "basic authentication", that little box like:

Enter username for "it" www-snap.it-services.nwu.edu

User Name:_______________
Password: _______________

Browsers automatically save the username and password associated with a specific host/port until the browser is terminated. Thus, it usually appears that a user has "Logged in" to a web service, because web browsers conspire to preserve that fiction.

Once a requestor is authenticated/identified, then the web server discovers which attributes are required to fulfill the request. The web server sends an authorization check to the authorization attribute server to decide if the web server will satisfy the request. If the authorization check fails, the request is refused with an access forbidden response. The authorization check protocol is the Mandarin CUSSP protocol, which is very simple, yet allows a very complex check. LDAP (Lightweight Directory Access Protocol) could be used through a SLAPD (Standalone Lightweight Directory Access Protocol) server. SLAPD permits a shell process to access to the SNAP database containing the authorization attributes.

Authorization attributes consist of such things as: student, staff, instructor for class 010102D30061, school WCAS, group "ac" (administer classes). Many of the attributes are derived from Registrar or Human Resources information that is part of the information feeds to SNAP. Some attributes are relatively permanent; others are so transient that their database is rebuilt each night. Some attributes such as "ac" are managed manually through a web interface. Of course, the web interface tests attributes to see whether a requested change is authorized.

A subset of these attributes is communicated to the synchronized NT and UNIX hosts. These attributes are mapped to groups on the remote hosts, and users on the hosts have group memberships. The account administration software on remote host executes native routines or scripts to create, delete, and alter users. Special exits permit further customization of actions on the remote hosts.

The group management interface permits creating new groups, altering group characteristics and adding members to groups. Groups and group memberships all have an expiration date. At the expiration date, the group membership or group with all its memberships expires. Some of the attributes of a group are:

- name -- a unique name of the group
- termination days -- (-9999 means no termination)
- control -- a rule specifying those who can change group membership
- read -- a rule specifying those who can list group members
- description -- a short description of the use of this group
- owner -- a group or NetID who can change group characteristics
- towarn -- an email address to be warned of group/membership termination
- termination action -- notify (member? owner? membership creator? towarn? ...)
- creation date
- change date

Group memberships have the following attributes:

- NetID -- of member
- group -- may be a class, automatic group or manual group
- termination days -- cannot exceed life of group

- role -- groups have a few roles which are descriptive (owner, view, control, regular)
- creator NetID -- last NetID altering membership
- creation date
- change date

Rules describe a set of group memberships which must be true:

- ac -- requestor a member of group ac
- ac dc -- requestor a member of group ac or group dc
- ac - dc -- requestor a member of group ac but not group dc
- dc - (ac pulse) -- requestor a member of ac but not a member of either ac or pulse
- ac + dc -- requestor a member of ac and dc
- ac.c -- requestor a member of ac with role c (control)
- ac.v -- requestor a member of ac with role v (view)

A rule is specified by a server to determine authorization of a request an. In a sense, the rules are arbitrary and do not need to use the implied meaning of the group. A server could use rule "ac.c" for viewing a page, and use the rule "ac.v" for changing group membership. Although server rules can use arbitrary meanings for groups, the rules should use the published meanings of the group to prevent chaos. In a system with many authorities, keeping communication straight is critical and difficult.

The termination of memberships is the most problematic area of design. I have not yet implemented a termination warning, because I haven't been quite sure what the best policy's are. In almost ever case, I can think of counter policy for notifying someone about termination. However, I am sure that I want groups and memberships to terminate. Groups fall out of usage. There are already hundreds of groups and there need to be termination rules.

The SNAP process has been in development in C++ on HPUX UNIX for about 5 years. The group management functions have been developed in the last 3 years, with the class list information being used for about 2 years. Throughout this period there have been 2 persons working on this and other projects. Each increase in function has broadened the amount of usage on campus.

EDUCAUSE *Information Resources Library*

Transforming Education Through Information Technologies

Abstract

Category: Papers Presented at EDUCAUSE annual conferences

ID Number:	EDU9930
Title:	Implementation and Implications of Digital Services in Learning Centers
Author:	Otmar K.E. Foelsche
Organization:	Dartmouth College
Year:	1999
Abstract:	This paper addresses the challenges of digital vs. analog services, network bandwidth, and delivery over internal and external networks, server technology, conversion technology, platform compatibility issues, and implications for learning and teaching. Included is a report on Dartmouth's experience, as well as information on planning, implementation, implications, and cost effectiveness of a move to digital services.

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Implementation and Implications of Digital Services in Learning Centers

Otmar K.E. Foelsche, Dartmouth College

Learning centers at institutions of higher learning cannot be strictly defined and described. All of these centers somehow developed out of specific institutional needs that recognized the advantages of space, resources, and technology as useful supplements to instruction in the traditional classroom. Learning centers, therefore, developed from language laboratories, library facilities, AV facilities, resource rooms, and laboratories--some serving specific disciplines, others serving a broad spectrum of disciplines--just as present computer centers serve not only students of information sciences, but students of all disciplines in a variety of ways.

In 1999 few learning centers exist without some level of digital services. On the most basic level, this may be a low-end computer with a printer for word processing. On the more advanced level there may be dozens of high-end networked computers connected to the Internet. Dartmouth's Language Lab, for example, has gone through various transformations during the last 13 years. Until about 1987 the mission of our center was clearly defined. The center needed to provide language learning support services via cassette tape, playback and recording facilities, as well as copying facilities for all language students on campus. Today the mission is no longer that clear. There is still a need for these traditional services because language instruction has not changed dramatically over the last thirteen years. But these services are now being delivered via different technologies. Whether the different vehicle of delivery or the improved access will change language instruction remains to be seen.

Further, we see additional services being requested through new technologies as old technologies fade away. While cassette tapes are being replaced by compact disc audio, MP3 players, and streaming network delivery, recent sophisticated technologies like laser disc stations--in high demand just ten years ago--have faded away, due to lack of materials useful in the academic environment and high maintenance effort. DVD is just about ready to take over.

We can also find equipment and machinery in language learning centers often consisting of extremely dedicated machinery, which is maintained by "self-trained" personnel. However, the future situation will be rather different, with new equipment applicable to numerous disciplines, and with the same personnel struggling every day to keep up with the changes.

There seems to be little doubt that language centers will eventually transform from a facility that is focused exclusively on languages to a facility that is focused on many disciplines. It is also possible that other learning centers in other disciplines on campus will provide at least some of the services of the current language centers. Being a director of a language resource center, I can attest to the difficulty in offering the same level of service without the presence of properly trained personnel. These discipline specific services are not only word processing and printing in the less commonly taught languages like Chinese, Japanese, Korean, and Indic languages, but there are also broad technical and pedagogical services on all levels of language teaching and learning, of which I can only list a few here--foreign language e-mail, web browser configurations, handling radio and television sources, digital conversions, text conversions, language learning environments on CD-ROMs and DVDs, and more.

The data on the following chart shows what has happened in my own center from 1987 until today. In some areas planning is underway for the year 2001--but since nobody can (or should) predict the future, I have left many question marks in the 2001 column.

	actual			projected	
	1987	1995	1997	1999	2001
audio cassette stations	50	40	22	10	5(?)
VCR station	none	7	6	6	6(?)
multi-standard VCR	none	3	3	1	1
satellite dishes	1	4	5	9	9
SCOLA	no	yes	yes	yes	no
other TV providers	0	0	2	5	5(?)
dedicated campus cable channels	1	3	4	6-10	10+
laserdisc stations	5	3	1	1	1
DVD stations	0	0	0	1	5
Multi-standard DVD	0	0	0	1	4
high speed cass. copier	1	1	1	1	1
cassette tapes purchased	1500	1000	500	0	0
computers (Mac)	1	7	9	15	?
computers (PC)	none	2	2	6	?
file servers	0	1	5	3	3
file server capacity	0	300meg	4gig	180gig	400gig
AppleShare	yes	yes	yes	yes	yes
NT	no	no	no	yes	yes
Linux	no	no	no	yes	yes
OSX(Apple)	no	no	no	yes	yes
AIX	no	yes	yes	yes	no
streaming video (SIG	no	no	yes	yes	no
streaming video (RTSP)	no	no	no	yes	yes
DDS backup drive systems	0	1	2	2	2
CD burner	1(4x)	2(4x)	2(4x)	2(4x)	2(8x)
CD-R blanks purchased	0	10	100	300	?
DVD burner	no	no	no	no	yes
network Appletalk	20	30	30	10	1
network Ethernet (10BT)	0	10	30	30	1
Network Ethernet (100Base T)	0	0	7	15	30
beds connected to network	all	all	all	all	all
backbone	10	100	100	100	ATM?
visits per week (fall term)	1500	1200	1000	800	500
space occupied		1500	1500	1500	1500 ?
number of languages served	8	9	11	12	13
staff persons FTE	3.5	2.5	3	3	3

If there is a single determing factor for the implementation of digital services it is probably the rapid advance of the capabilities of digital technologies in general. Services of this nature were predictable in the mid-eighties, but were definitely tied to expected increase in CPU speeds, lower storage cost and higher network bandwidths. The chart provides some interesting insight as to where our major investments were made with a generally stable budget. These were: network, servers and server capacity, number of languages taught (always a major investment!), and workstations. Interesting to note: attendance in the center shows a steady drop (we expected that users would quickly switch over to the digital services), purchases of cassette tapes plummeted down to zero, whereas purchases of CD-R media increased dramatically. Our personnel appears to be only slightly reduced by 1/2 FTE during this period. This probably requires some explanation. One of these FTEs is for a manager of humanities computing, providing computing support for faculty in the humanities. Another one is for the director of the center, and the third one is for the assistant director. All three persons are interchangeable up to a certain point. This allows us great flexibility in handling all daily routines with the help of a group of trained student assistants. All three FTEs have received a lot of training (or learned on the job) about the new technologies. Implementation of the new services would have been impossible without the enthusiastic cooperation of the staff and student assistants.

We expect that attendance in the center will go down further for reasons already stated, that the number of languages supported will probably go up for reasons of distance education, and that the file server capacity will increase further to provide more materials--while the budget will remain the same.

During the last decade, planning for the implementation of digital services was probably in the minds of all those persons who were watching the progress of this technology, and who were willing to devote time and effort into some futuristic thinking about the role of digital services in educational situations. At Dartmouth we went through several iterations of this--implementing a time sharing system; Avatar terminal clusters in the late seventies; the introduction of the Macintosh in 1983; the introduction of a network reaching to every desk and every dormitory room in 1983; and, most significantly, various software/infrastructure developments: a GUI mailsystem in 1988--Blitzmail, DCIS, the Dartmouth College Information System beginning in 1989; and of course today, text, images, audio, and video via the network--as part of the information system as well as part of various centers at the institution.

In our implementation of these ideas at Dartmouth, the basic convincing arguments for the implementation of digital services were 24-hour availability, similar if not better quality of service, long-term cost-saving, and long-term positioning of the institution in the use of the Internet for purposes not yet fully discussed. Another important argument was the utilization of Internet II and the possibility of cooperating with other institutions with similar bandwidth for research and instructional purposes.

No precise overall plan for the implementation existed. Instead, "management" signalled that it was all right to experiment and that the backup infrastructure would be provided. That was all that was needed to get a number of people on campus excited.

With Dartmouth's decision in 1993 to redo its network, some realistic thinking about the delivery of digital services and bandwidth could begin. The decision making process was not easy. Dartmouth had established one of the largest AppleTalk networks in 1983 that was already reaching to every bed, office, and classroom on campus. Hardware and software connecting more than 6000 users was almost completely "in-house" development. Therefore, there were advantages and also disadvantages when compared with commercially developed hardware and software becoming avaible in the late eighties. But in 1993 the network was simply too slow for the services we wanted to implement!

Re-installing the network was a major effort that was to eliminate more than 20 years of various generations of hardware. This consisted not only of outdated computer networks, but also of the telephone networks and the campus cable co-ax network. In addition, it also meant the institution would regain control over a network that had been extended by various departments and laboratories for their own needs through additional wiring, extensions, and cascading. This two year process included 1) removing every piece of wiring in all buildings that was not part of various alarm systems, HVAC, or electric power, 2) the installation of central service points in every building, and the installation of raceways, conduits, and outlets, 3) the installation of of a fiber back bone with all the necessary hardware providing Internet II access, and 4) discussions with most individuals and departments on campus to determine local needs.

In many instances we ended up with compromises that could be changed easily in the future. These compromises were: shared ethernet in most places rather than switched ethernet. Shared 100BaseT rather than switched 100BaseT. No fiber to the workstation, but CAT5--expecting that this type of wiring would be sufficient for a while to keep up with higher ethernet speeds. No dark fiber was installed.

While the network was being installed in various locations on campus, an ad hoc group discussed bandwidth requirements, storage needs, and prospective technologies for audio and video services. The best decision, having been influenced by budget constraints as well as the experience we gained from other institutions, was to avoid buying into dedicated hardware and software packages which ran at above $100,000 at the time the discussions took place. We knew that we would fall behind a few illustrious institutions but were quite convinced that we could do better from scratch and with future technologies "to be available soon." Our second best decision in the process--not really a decision but the way we let things happen--was an "experiment and wait" kind of attitude that saved us enormous amounts of money but still allowed us to become comfortable with the required technologies, provide demonstrations to faculty and students, and implement some limited services in controlled environments, i.e. the Language Resource Center. (It is always easy to describe the process after the fact. The dynamics of these processes are far more complex than I could describe here. The driving force behind all this lies probably with some people who are not *directly* involved in instruction, but have the understanding of what digital technologies can possibly do for instruction. In other words, it was not the faculty pushing for these services.)

We identified about 15 issues or areas that were to guide us during the implementation process:

1. 24 hour access to most materials

2. digital services had to be at least as good as existing analog services

3. all services had to be PC/Mac compatible

4. file formats had to be within industry standards with strong support by vendors

5. delivery schemes for distance education should be kept in mind

6. traditional services should be maintained until digital services became accepted and stable (maintenance of parallel technology)

7. commitment to a fast phase-in of complete audio digital services

8. long-term goal of complete elimination of analog services

9. users bearing some of the "cost of access"

10. digital services must be cheaper than analog services after initial phase

11. long-term reduction in personnel, but higher qualification

12. hardware investment no longer dedicated to a specific discipline

13. long-term reduction in required space for maintaining services

14 . improved handling of copyright issues

15 . expected significant impact on teaching and learning

Time does not permit me to provide exhaustive details on all of the above. But I will try to address some of those points where we accumulated some experience.

24-Hour Access

This appeared to be the most convincing argument for the introduction of digital services. Our present lab is open for about 84 hours every week. Still, all of us who work at universities know that students as well as faculty want to have access to libraries and other facilities on a 24-hour basis. When I started to check the logs of our servers, I found that the peak server hours were at one o'clock at night and at 7:30 in the morning. The nighttime surge is no surprise, and the morning surge is probably a Dartmouth specific phenomenon, since our language drill sessions start at 7:45 and we assume that students prepare themselves for these sessions by turning on their computers.

Audio Quality

Since we were dealing with languages, the audio quality of existing master tapes appeared to be the standard for the digital lab. Unfortunately, master audio tapes are almost always second or third generation when they are sent out by the publishers to the consumer. These tapes contain not only a lot of noise but also have additional flaws accumulated through several generations of high speed copying processes. We had no choice but to use these less than perfect materials for our first implementations. In the long run, it may be better to request the original digital masters from publishers and transfer the digital data directly to a server. I would not rule it out at all that publishers may force institutions to use audio materials on the publishers' web sites to assure the best quality for all users. But this is a step that can only be taken once 1) appropriate bandwidth is available to all, and 2) a sensible billing mechanism is available that protects the publisher's interests and makes these materials available at a reasonable cost to the consumer.

Digitizing of audio materials is performed on mid-level machines on most platforms, with commercial software that is easily obtainable. Digitizing has to be done in real time. In other words, a thirty minute audio cassette tape will be digitized in exactly thirty minutes. Most digitizing software is capable of setting the process to various sample sizes like 8-bit, 16-bit, or 32-bit resolution and sample rates between 8 and roughly 44k per second. Most digitizing software is also capable of producing various file formats or converting one file format to another. Just like producing master tapes to the highest specifications, implementers of digital services should consider storing the highest possible quality (or at least a level of digitization that renders the complete range of the original). Obviously this approach requires enormous amounts of storage so that a compromise is indicated.

In our tests with various audio tapes used in language laboratories we discovered very soon that we would not need compact audio disk quality for materials that came not even close to it on tape. In addition, we had seen the experience at Otago University in New Zealand which had implemented a digital audio lab in 1993 that used final data rate 5k per second. This low data rate was produced by using digitization at 16-bit/44k and compression to 8-bit/22k at IMA 1/4. The final product was hardly distinguishable from the original tape.

The resulting file could be played directly. It could get decompressed and saved in various formats. We decided to put it into a QuickTime container to make it compatible for the PC and Mac platform. The total space requirement for all audio files in use during the fall term 1999 is about 10 gigabytes--representing about 1000 C30 tapes, backed up on approximately 35 CDs.

More important than all of the above was our decision to "edit down" the audio tapes to the exercise level. The problem with analog services from cassette tapes is that it is time consuming and frustrating to go to specific exercises, or drill on a 30-minute cassette tape. Sometimes the tape needs to be fast-forwarded to the exercise which can take close to two minutes. Then it may need to be rewound for an exercise at the beginning of the tape, another two minutes. With an "edited down" tape the student can open the workbook and access in seconds the tape section that he/she needs. This "editing down" was performed by several Dartmouth students who were competent in the respective languages.

Video Quality

Whereas dealing with audio materials was relatively straight forward, dealing with video materials was far more challenging. Fortunately, recent technological developments have solved many of the challenges we encountered but have also made a number of vendors vanish from the market. Today we can produce video in acceptable quality with off-the-shelf software and hardware and off-the-shelf machines.

I first saw digital video in the form of a stamp sized window in a Hypercard stack in 1989 at a demonstration by Apple in Munich, Germany. I was immediately taken by the enormous possibilities lying in the simultaneous handling of moving images, audio, and text on the computer screen. Only three years later, David Bantz and I demonstrated a learning environment that contained parts of Goethe's

Faust with text, video, audio, and more.

But our implementation of digital video needed a far higher quality than what we could produce then, and it also had to be capable of being stored in reasonable amounts of space and served at reasonable bandwidths. Commercial providers early on had jumped on the bandwagon of MPEG-1 and streaming servers based on dual or quadruple processors feeding via FDDI or ATM into switches connected to networks. Clients either used special hardware to decode the streaming signal or high-end machines that could decode with appropriate client software. Servers used large arrays of hard drives to provide enough space for mounting dozens of hours of videos. According to the companies, 25, 50, or even a 100 clients could look at the same file at different positions. We did not buy one of the packages but opted instead for a piece of software that enabled us to install a minimal server for 25 clients on an existing high end workstation. The server worked fine for us in Windows and NT environments with very acceptable picture and sound quality. The promised Macintosh client has not been delivered in a stable version yet. Since our campus is even today 80% Macintosh we would have been in deep water had we relied on this particular company. This no-cost waiting permitted us to see the development of other options in the video area and even test out some of our own.

While we were waiting for a stable Macintosh client for the video server, we decided to do some testing with an AppleShare server in the language lab. To our great surprise, video and sound came across quite well. We went up to about six clients with satisfactory results, the seventh client began showing hiccups and the eighth only had intermittent video and audio. An increase in CPU speed to 350 MHz and a switched 100BaseT connection for the server to the Intranet solved that problem easily, and provided services to dormitories as well. I do not know how many clients we can serve with the AppleShare Server, since we have only tested as far as 13 simultaneous clients.

We put the same files on an NT server and observed a rather similar performance. Let me remind you that we were dealing with MPEG-1 which requires around 150k per second. Since we were not dealing with streaming, the complete overhead of file services from the NT environment and the AppleShare environment came down with the files, lowering the available bandwidth somewhat. But with this approach we had an environment that we could let faculty and students use and collect feedback from them.

Production of MPEG-1 can be done in real time on special hardware or in a slow fashion with special software. Nowadays, MPEG-1 hardware boards are coming down to less than $1,000 and produce reliable results. Problematic in MPEG-1 production is the lack of sophisticated editing and video control capabilities. Most boards and their respective software allow only cutting at the beginning or the end of a file. Image size, color, contrast, and saturation cannot be set. But bit-rate for video and audio can normally be adjusted.

In general, we accepted smaller flaws like a slightly imperfect frame or color balance for the convenience of the production. We started using the 3DO board but later switched to the ButaneII board. 3DO has disappeared. The ButaneII vendor (Wired, Inc.) is still around and has been a reliable vendor for us.

Other digitizing methods depend on software compression and can take enormous amounts of time, like 20 to 40 minutes for a one minute clip. Additional choices are 1) M-JPEG, producing comparatively large files, and 2) the Sorenson codec, which is extremely slow in production but produces excellent results at low bit-rates. A special hardware solution has just become available for the Sorenson codec. But even this hardware does not encode in real time. A $9,000 investment results in a factor of 6 minutes of processing for a one minute video clip. This is much better, but still not as good as encoding in real time.

Quality: Stills

Dartmouth's slide collection for art history is already partially converted. Other slide collections on campus are being digitized slowly. In most cases standard slide scanning and flat bed eqipment is being used for scanning in resolutions that are appropriate to the needs of the discipline. Art history, in particular, expects the highest resolution with zooming capability into sections of each image. Other disciplines are more willing to make compromises, putting the number of available images ahead of the quality of each individual image. Slide collections being used as realia in language instruction are normally low level JPEG format and are served via a web interface. Slide collections in the art history department are served through a special Dartmouth-developed interface at much higher resolutions that allow zooming.

CD-ROM Packages

Learning centers have growing collections of various CDs for individualized learning or as supplements for textbooks. If these CDs are properly constructed (assuming the license arrangements are favorable) they can be mounted on servers and will be accessible to one or multiple users. This is an enormous advantage over letting users handle irreplaceable CDs on machines in the lab. The performance of CDs over the network is as good as on a CD drive on a lab machine. Copying a whole CD into the server is another option, especially when enough server capacity is available.

Compatibility and Standards

Audio and video file format compatibility for Windows and Macs has improved over the last year. In the past we used to save files in PC formats as well as Macintosh formats in order to serve them on the respective servers, i.e. NT and AppleShare. There were many reasons for this that I no longer need to address in detail, because things have changed so much. Among the many blunders we made in our implementation, there was one that caused us some real time-consuming efforts. Being Macintosh users we had ignored PC naming conventions and were forced to rename literally hundreds of files to make them playable on both platforms.

All of our audio files used to be in IMA compressed QuickTime format. We decided to change the "container" to what is called "hinted QuickTime." A hinted QuickTime container can be played through Media Player on a PC, and it can be played through MoviePlayer on a Macintosh. Last but not least, the hinted QuickTime format can be served from a shared partition on a Mac OSX server, or from a shared partition on an NT server. And, it can also be played from a streaming QuickTime Server on an OSX Server. Our main server for audio, therefore, is now a streaming QuickTime Server accessible through web pages working just fine for either platform. This has solved all of our compatibility problems for audio files.

The situation for video is not quite as simple. We do not have the option (yet) of converting MPEG files into a format that is acceptable for the streaming QuickTime server. Apple has hinted that it is close to providing this solution. At this point, we are serving video from an NT Server to both Macintosh and PC clients. The server contains so-called raw MPEG files that can be viewed with MediaPlayer on the PC side and with MoviePlayer 4 on the Macintosh side. In the long run the video files have to be served from a streaming server as well so that we can be sure that we can satisfy the needs of large numbers of simultaneous clients. Assuming that industry will provide this solution, the dream of a streaming video and audio server for less than $2,000 would become a reality.

Archiving

Some institutions have acquired enormous amounts of materials that are on reel-to-reel or cassette tape as audio or video files. The life expectancy of these magnetic media is anywhere from a couple of years to about thirty years depending on the quality of the tape and the storage conditions. We decided to archive our digital data on CD ROMs hoping for a life expectancy of about thirty years, more or less. We find it very important that two copies are kept of all materials and stored in different buildings. Storing on DVD discs would also make sense. But CDs, at least at this moment in 1999, are a far cheaper storage medium than DVDs.

Distance Education

We have tested our setup from various universities on Internet II with expected excellent results--in most cases as good as on our campus. With other connections one can expect at least good audio. The implications of the streaming server technology for distance education are well known and I do not need to dwell on them here. Industry has sent signals that they believe that this technology is ready to use for broadcasting special events at any time now. Our experience indicates that this is correct as long as the size of the video window is kept reasonably small so that data rates stay at 25--35 KB. Broadcasting can also be implemented through the use of RealServer technology, but at a higher price.

Maintaining Traditional Services, Phasing out, and Phasing in of Digital Services

Things have to work well and must be totally reliable. There is no point in switching over to digital services when quality and reliability cannot be met. Our declared policy from the beginning was to maintain complete "parallel technology"--in other words, maintain the traditional services completely while spreading the word that digital services were also available. We went through a whole year of this approach, with users not minding occasional shutdowns of servers, since all had been warned often about the experimental nature of these services.

In our case, we started with a 50 station audio lab and established limited digital services while reducing available conventional stations to 20. This worked well, because with a single server and exclusive AppleShare services we needed to deal with several breakdowns. This year we reduced the number of stations to 10 but tripled the server redundancy to three in order to allow Mac users to access files at three locations and PC users at two. This was a very wise decision, because our main AppleShare server broke down three days into the term with some hard disk problems. Even with the loss of one server we were able to satisfy all client needs with the remaining server until a replacement 18gigabyte disk arrived.

At this point, we have no plans to phase out our last ten traditional workstations. Since we did not implement recording capabilities in our system, clients who think they need this capability can still use the traditional cassette machines. We expect to implement recording in the future but do not feel any urgency or pressure for this feature from faculty and students.

Students have accepted the digital services rather nonchalantly. They expect this kind of service from a high-tech university just as they expect the library catalog, e-mail, and the internet on their own machines. Faculty--and this is the case in many institutions - normally stays away from services provided in language labs. But with the advent of fully-equipped classrooms with data projection and complete access to the servers, we have seen some instructors integrating the technology into their classes. There is the Chinese language instructor who runs the ten characters of the day on the projection screen in automatic mode before the class starts. There is the film studies instructor who has about a dozen short clips on the server to support his lecture. There is the Russian instructor who goes over the lab exercises in the workbook while running the audio track in the classroom. And there is the linguistics instructor having almost complete access to all her sound files on the server when lecturing or answering a student's question.

Users Bearing the "Cost of Access"--More Cost-Effective Services

Our students are required to have a computer while on campus. This allows us to keep the number of workstations in lab clusters across campus fairly small. We have not done any exact cost comparisons between the traditional lab and the new digital services, since today's situation is more or less a hybrid one. In the long run, especially if a dollar figure is attached to the 24-hour access and the dramatic increase in the number of users who can be served simultaneously, the equation would probably look very much in favor of digital services. Today, traditional equipment and maintenance cost are probably about the same as the cost of servers and other necessary devices for the delivery of digital services. In the future we can expect further reductions in the cost of providing digital services and we can probably forecast tremendous improvements in the quality of delivery.

Personnel

The traditional language lab director or learning center director as well as his/her staff has seen some significant changes over the last decade. Video, computers, CDs, and network have invaded a space that had not seen any significant changes in technology since reel-to reel-tape was first introduced in the mid-fifties. Job descriptions for recent openings for managers of language labs, learning centers, media centers etc. are looking for persons that simply do not exist. Institutions are looking for supermen or superwomen that have at least language teaching experience at the college level, are familiar with language acquisition theory, are competent in using PCs and Macintoshes, are competent in web design and writing JavaScript, are competent in network issues, can train faculty in the application of these new technologies, are familiar with the technical requirements of the less commonly taught languages, i.e. Chinese, Japanese, Russian, Hebrew and possibly Korean and Indic languages, have a Ph.D., can teach at least one course per term, and are willing to begin with a salary that is about half of what is offered to an Assistant Professor on the tenure track. None of us are so superhuman that we could perform all these tasks really well. A keen interest in the new technologies as well as an enthusiasm for learning appears to be the most desirable quality of persons wishing to enter this profession. From a professional point of view, a more comprehensive and precise definition of training and responsibilities of learning centers is needed.

Some institutions are now providing training at the graduate level for media specialists or educational technology specialists. This is a good beginning. I feel that an apprenticeship of about a year in one of the major institutions, which would concentrate on computing services, AV services, language service as well as instructional technology in the classroom after a graduate degree in any field, would be a good starter for persons wanting to enter this field.

Some of the old hands in the field have made the transition with enthusiasm and feel very comfortable with their totally changed job descriptions. Others have given up and allowed campus politics take over their domains--with computing services, AV services, libraries, or faculty committees presiding over the demise of broken down equipment in a more or less abandoned basement room.

There is very little work left that can be performed by low-level personnel--the times of the "curator of tapes" are over. The new learning center requires less, but more competent personnel. Even digitizing materials requires the competent judgment of a person with at least some experience in the language. Editing materials requires more linguistic experience. Troubleshooting, configurations, and training requires experience that can only be gained on the job.

In other words, learning center personnel will have to be truly professional and should be respected as such. If an institution expects the director to train faculty, then the director should be respected as an equal and should receive similar pay and benefits. This refers particularly to training and sabbaticals as well as travel allowances.

Space

Depending on the institution's utilization of digital services, most space should be repurposed somewhat and optimized for the new technologies. Actual space savings are possible, especially in those situations where generous space was allowed in the past for the public as well as for production, archives, and offices. Repurposing of space should first of all emphasize a secure server room, a secure archive, and comfortable production space. Secondly, again depending on the respective institution's needs in space planning, it should emphasize group meeting areas and individual workstation areas that are completely equipped. One can safely assume that all standard work requiring audio and video is probably done via the network. More sophisticated work like word processing and printing in Chinese, video-conferencing, and learning with self-access materials will probably be done in the center. A learning center should also archive its materials in different buildings to prepare for catastrophes like fires or earthquakes.

Ownership / Copyright Issues

Learning Centers, libraries and AV facilities are not very popular with their clients when they have to refuse to copy tapes or other media for various purposes.

Originally the purchase of a tape set accompanying a textbook provided permission to make as many copies as needed for *x* number of workstations in a lab. Some publishers also permitted the production of copies for students as long as this service was provided for free. Digitizing such tapes and making them available over the network seems to pass as fair use in many institutions and many publishers, when asked, have given permission for this.

The purchase of a video tape, on the other hand, does not enable the center to make copies. A client can take the tape and play it on a video station. Digitizing the tape and allowing a single user to view it via a network is probably contrary to fair use, since the original has been transferred to a different medium and will not get used up with subsequent showings. Providing access to multiple viewers on the same file is probably an even worse scenario from the lawyers' perspective. The situation is more complex with foreign tapes coming in different standards that can easily be changed into digital format.

But this is not the place to go into any further details. These are very important issues that will have to be solved in talks involving all parties. The IALL (International Association of Learning Laboratories) has already had one long meeting with publishers' representatives to discuss the issues involved. I am sure that all parties are quite reasonable and will arrive at a consensus that will allow learning centers to provide commercial materials in sensible ways.

Let me finish my remarks with a few demonstations of the Dartmouth digital environment.

Demo 1. This demonstration will show the web entry point for all audio resources that used to be on tapes in the language resource center. Students click through the hierarchy of directories to arrive at specific audio files for activities in their workbooks or lab manuals. The use of this website requires a browser and a QuickTime 4.0 (or higher) installation. We'll play one audio file via the internet.

Demo 2. This demonstration will show the entry point for the NT-server that contains the same audio materials as the web server. In addition, this server contains all video files that are in use in undergraduate language instruction. The NT-server is a so-called "shared environment" and is visible to users on the AppleShare network and on the NT network, which, of course, are running on the TCP/IP based campus ethernet. We'll try to play the same audio file which we played from the web server. We'll also try to play a video file, depending on the available bandwidth.

Conclusion

Digital services are the way to go. They are accepted, they are used, and they are here to stay. We had feedback from about 200 users last year with generally positive results. This year's feedback so far has focused on a single issue: when are the servers up again? As you may be able to imagine, up North, we do have occasional power failures and servers do not always come back by themselves….

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Abstract

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ID Number:	EDU9912
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Organization:	Rensselaer Polytechnic Institute
Year:	1999
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Implementation Projects: Land Mines and Other Lessons

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Abstract

Rensselaer Polytechnic Institute totally replaced its administrative computing systems in a series of projects during the 1990s. Along the way many lessons were learned, and recent projects have been consistently successful. This paper looks at the process by which new systems are implemented and highlights the lessons learned. Six phases are identified, covering the entire process from first concept and software selection through ongoing upgrade efforts and thirteen "Land Mines", or common mistakes, are identified. Two large projects that implemented much of the Banner suite from Systems & Computer Technology Corporation (SCT) are used to provide examples.

EduCAUSE 99
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This is a paper about system implementation projects, those long difficult journeys by which organizations move from an old set of technology to a new one. Following a trend that goes back to the 1980s these projects are far more common now than software development projects. Few organizations have the combination of size and uniqueness to justify developing software from scratch, and instead most will buy systems if they are available. Small systems, those with only a handful of end users and that are largely self-contained, are often installed with few problems. This paper looks at the implementation of large systems, those that span multiple business functions and may include a variety of technologies. These systems have assumed the central role in handling operations at many institutions.

Large implementation projects are long – usually spanning several years from first conception and investigation through the final wrap up, and they are complex, including a variety of technologies and crossing numerous organizational boundaries. Two other characteristics also contribute to their risk. First, these projects are often attempted by institutions after a long period of stability, implying that there is little organizational experience. Second, these projects can vary widely in nature as the technology evolves. Tales of woe are all too common.

In this paper I am going to concentrate on certain on "Land Mines", mistakes that can rest beneath the surface of a project and then "blow up" to cause serious problems. To some people this may seem to be a rather dismal approach – concentrating on the negative, mistakes to be avoided, rather than on the positive. I don't admit to being a pessimist, quite the opposite. Instead, I am concentrating on these points because all of these land mines have occurred on real projects that I have witnessed, both at Rensselaer and other institutions. It is more common for projects at different institutions to share these problems than the specific approaches to success, and in hindsight these mistakes are often easily visible. Many of these land mines are traps for optimists, and project teams, at least the successful ones, are full of optimists.

It is only a coincidence that I list 13 land mines.

Rensselaer Polytechnic Institute moved through a typical cycle with its administrative systems over the last three decades. Early on in the 1960s and 1970s Rensselaer acquired computers and began to write software to support administrative processing. As the 1970s advanced, vendors appeared offering products that provided more and better functionality in comparison to what could be written in house. Some of this was acquired including portions of the administrative suite from Information Associates, Inc. This was installed with other administrative systems on an IBM mainframe running Michigan Terminal System, a state-of-the-art timesharing operating system that served a broad array of campus users.

After purchase the software was maintained in house without a great expenditure of effort. As a result the systems maintained the same level of late 1970s technology, which was noticeably out of date by 1989. In that year problems with the financial system prompted the university to begin investigating a replacement. Around the same time much of the academic computing began to move off of MTS and on to networked UNIX systems. The writing was on the wall for the future of the MTS system by the early 1990s. The project to replace the financial and payroll systems was only the first of many through the 1990s as, one by one, newer and better replacements were found for all of the systems supported by MTS. This process was only completed this year, 1999, with the final shutdown of MTS.

The first project, called FAIMS (Financial and Administrative Information Management System) implemented the Banner Finance and Human Resources system from Systems & Computer Technology Corporation (SCT), with software selection occurring in 1990 and the implementation running from 1991 through 1994. The project was a success, but only eventually and with a great deal of pain and disruption. Starting in 1994 the university convened another group to define a replacement for all of the student services systems. This group also selected the SCT Banner product, the Student and Financial Aid Systems, and in contrast to FAIMS this product was installed during 1996-1999 with great success.

What has become apparent from these and numerous smaller projects is that implementations tend to move through phases. The idea of phases is not radical per se: it is reasonable to expect that similar efforts would pass through similar evolutions. However, dividing an effort into phases helps highlight the differences in the activities at each stage. What's more, it becomes more apparent how mistakes made in one stage in turn affect activities in later ones. Mistakes are often cumulative, with problems in the early phases persisting through the course of the entire project, and the effects multiply in combination with other mistakes.

In this paper I discuss six phases that cover the entire life of a project. These phases and their characteristics are listed in Figure 1.

Phase 1: Foundation

The foundation phase of the project is the beginning, the time when nothing may be known but the need for something new. During this phase the project takes form until, at the end of the phase, it is approved and implementation work can start. In many ways the Foundation phase is the most important because it is during this time that the end goal is defined along with the means to get there. Like a building, it is not unusual to find problems appearing in other parts that can be traced back to problems in the Foundation.

The end result of the activity during the first phase is a project definition, whether written or tacitly understood. This definition answers crucial questions including:

- What overall results are expected as part of this project? How will improvements be visible to students, faculty, staff, alumni, or other stakeholders?
- What technical solution is required?

- What resources (time, money, and people) are required?
- What is the high level plan for implementing the solution? What timeframe can be expected and how will the project be organized?

Land Mine 1: Assuming that choosing a system is the same is defining the project.

At Rensselaer a Selection Committee was established in July 1994 to select software to replace the aging student and financial aid systems. Even at this early stage the committee received some funds so that committee members could take trips to other schools, attend conferences and, if needed, consultants could be engaged. The charter for this committee included writing the project definition as described above in addition to recommending a specific package.

Over the next fifteen months the committee carried out a variety of activities, including:

- In conjunction with university leadership several objectives and guiding principles were defined. These included important decisions such as favoring an integrated solution rather than a series of "best of breed" systems, aiming for "state of the industry" rather than "state of the art", and implementing with the understanding that there would be "minimal modifications to the baseline software".
- Mapping business processes. This activity quickly provided invaluable information on required functionality and the maps were important in developing a formal Request For Information (RFI).
- Visiting several other schools to see a variety of systems in daily use.
- Inviting several vendors to provide demonstrations before writing the RFI.
- Issuing the RFI, reviewing and comparing the responses, and then inviting vendors to provide detailed demonstrations based on Rensselaer developed scenarios.
- Engaging a respected consulting firm to review the selection process and facilitate two key decision-making meetings.
- Developing a high-level project plan including a schedule of milestones, hardware and software requirements, staffing needs, and budget.
- Benchmarking the project definition against similar projects either underway or complete at a number of other schools.

These activities resulted in a solid software selection, SCT Banner, and a complete project definition. In addition the process addressed several other people issues that are important to the success of any project. First, the group was able to achieve consensus on the correct solution. This did not happen overnight. It took time and a chance for everyone to work together before trust could be established among committee members, and more time for issues to be raised and addressed. A comprehensive process allowed the group time and the mechanisms to deal with conflicting aims and perceptions. The second issue addressed was the ability of the group to get work done. Early on the expectation was set that the project would be long and time-intensive for all involved. Over time a culture developed within the committee that this was real work (as opposed to many other committees) and that everyone would need to work hard and contribute.

The third issue dealt with the expectations for the project by the campus community, especially the university leadership. Earlier projects had often suffered from "the squeeze", a phenomena in which the people selling the project play up the benefits while the budget request is successively trimmed by repeated layers of review. The obvious result is a project that is oversold and underfunded. In this case the project proposal avoided playing up the opportunities for miraculous improvement. The comprehensive planning process allowed a firm budget of 5.4 million dollars to be proposed (including $250,000 of unallocated contingency) and maintained through the entire approval process.

Land Mine 2: "The Squeeze". Overselling and underfunding the project in an effort to secure approval.

In the end the project developed a firm foundation. A solution and a plan to implement it were defined and the resources were secured to make the project a success. Everyone had a clear expectation with regard to the amount of work and risk involved along with realistic expectations about the benefits that would be achieved.

The carefully crafted project plan then suffered the ultimate disaster: it was approved.

Phase 2: Getting Started

The phase "Getting Started" covers the period during which work begins on the implementation up to the time that a smoothly functioning project is in place. Much of the effort during this time is simply spent in securing resources and getting things moving. Just because a project has been approved does not mean that work can begin the next day. Organizations need time to adjust while priorities are changed and prior commitments honored. In fact, one of the most common problems is that this stage is simply left out of the plan. Assumptions are made such as "in week two the vendor will be onsite to install a test system", ignoring the reality that there is no on-site staff available yet to work with the vendor. Even more extreme are cases where complicated contracts must be negotiated or that staff or consultants must be brought in from the outside, each of which can take weeks. Ignoring these activities can lead to projects that are weeks behind before they even get started.

Land Mine 3: "The land that time forgot". Not allowing time to get the project started and the team in place.

The Banner project at Rensselaer had allowed for startup when the plan was put together, but it did confront another uncomfortable reality. Implementation projects have schedules that are tied to the annual business cycle. For example, a new admissions system would typically be implemented to support the recruiting or application processing for a certain term. A financial system will most often go live with the start of a new fiscal year. For the Banner project the target was to bring functions up in time for a fall term, with a schedule of go-lives starting 10 months after approval. This plan was immediately squeezed before it started. As is often the case, the approval process moved to its own rhythms. At Rensselaer, the approval came two and one half months later than had been expected. Since dates such as the start of a semester are not flexible the project team was left with the choice of either making up the time or shifting the schedule out almost a year. The decision was made to move ahead with the shortened schedule.

As any project gets moving there are a many activities. As shown in Figure 2, one way to view these is to separate them into the project startup tasks versus the tasks of implementation. On the one hand the project startup tasks concern aspects of the entire project, while the initial implementation tasks concentrate on the near term, dealing with crucial items that are on the critical path. Figure 2 provides examples of each.

This phase calls for balance – indeed this is the original high-wire balancing act. Too much emphasis on project startup leads to paralysis as all of the effort is consumed on planning and preparation. Too much emphasis on the near-term implementation tasks leads to near term progress and long term confusion. A good rule of thumb is to focus near-term activities on the tasks necessary to bring up a test installation that can be used for training. This is usually on the critical path because of the lead time involved in procuring and installing the necessary hardware and software, and the requirement that this system be in place prior to functional training.

Land Mine 4: "The schizophrenia of startup". Not dealing with both long term planning AND the near term issues of getting a project in motion.

Working towards the short term goal of a training system highlights a series of necessary dependencies, namely:

1. Making business decisions on how to configure the system requires that people be knowledgeable (trained) on the system and have an installation available for experimentation.
2. To conduct functional training requires a system to train on so that people can learn "hands on".
3. A training system requires hardware and software.
4. Hardware and software require that technical staff be available and skilled with the technology.
5. For technical staff to be skilled may require training on new technology.

Leaving out one or more of these steps is all too common.

Land Mine 5: "Breaking the chain". Technical training > skilled support staff > training system > product training > business decision making.

Phase 3: Stealth

The third phase is the "stealth" phase, the time when the project, now approved and moving forward, falls off the radar screen of the institution and becomes a concern only to those who are immediately involved. It is during this "in between" time that most of the work is accomplished. Indeed, this is the last time period to address issues before going live, the last opportunity to ensure success.

The first problem many projects face is that old friend to most human endeavors, procrastination. Large projects are cursed with long timelines. In many cases the schedule may call for more than a year between startup and the first "go-live". Human nature being what it is, anything that is not happening within the next few weeks exists in a world of the indefinite future, a world that can always be worried about the next day. Everyone has enough crises to dominate "now" without worrying about projects that still have months to go. Obviously the problem with this picture is that there are months of work to do in the months allotted: the extra time is an illusion. While everyone usually accepts the idea that the project will have everyone overloaded come go-live, the challenge is to induce a sense of urgency from the beginning while there is still time to do something.

One approach is to simply talk up the problem in concrete terms. Using shorter units of time can help this. A message that "such and such must be ready in 27 weeks" can focus more attention than saying it must be ready sometime in April next year. Similarly, calendars that list the number of working days left before certain milestones helps state the time in an immediate form. Saying that something must be ready in 43 days can have more impact than "two months".

A more definitive approach is to set intermediate milestones, tangible achievements that help everyone focus in the short run. Typical milestones can include the readiness of the training system, the completion of vendor training, or the first round completion of the business decision-making and the system configuration.

Land Mine 6: "I love you, tomorrow..." Procrastination.

Another common trap is to lose sight of the solution while everyone concentrates on getting the system operational and fully configured. There's no doubt that there's much work to do: technology must be installed, the system must be configured with codes and rules, and who can forget reports. In this case it is easy for the system to seduce because it is now concrete. Checklists appear which list all of the tables that must be loaded, lists of existing and proposed reports are drafted, and data conversions mapped out. Slowly, the process of bringing the system to life begins to drive the project.

The danger with this is that the system by itself is *not* the solution. Many less tangible activities are also crucial, for example, ensuring that solutions are defined for the gaps in the software, developing a communication and training plan that covers the campus rollout, drafting and finalizing new policies and procedures. The complete solution covers the entire business process, and the system should not be allowed to eclipse that.

A similar problem arises as people begin to focus on specific parts of the system. Large and complex systems are difficult to deal with as a whole so the work must be split up into pieces. One group worries about generating bills, another about registering students, while a third focuses on admissions. In turn each group concentrates on its specific area of responsibility, configuring and testing to ensure each function works properly. What this view can miss is the overall process itself. Can a student be applied, accepted, registered for classes, and then billed? Does the process flow smoothly from one stage to the next? As assumptions or changes are made in one area, are they being reflected in the others?

Land Mine 7: Letting the system block the view of the solution.

Land Mine 8: Assuming that the whole = sum of the parts. Maybe it is, but maybe it isn't.

These types of problems are easily compounded by faith that all of the new technology and the system itself will work properly on the first try, and it will work exactly as expected. It rarely does. The best training course in the world is no substitute for hands on experience that works the system as it will be used at the institution. And there is nothing like exercising the system with all of the idiosyncrasies of the local implementation to find a unique bug that no other customer has ever seen.

Not adhering to this in the early stage of the Banner project was the single largest mistake. In this case the problem was not even with the new modules, but with products being upgraded in preparation for the additional installation. Early signs of potential problems were overlooked. There was no reason to expect that there were serious problems with some specific versions of the underlying Oracle tools. Instead, the upgrade work progressed slowly as problems were worked out one-by-one. By the time the situation came to a head the project had lost several months and required a complete reworking of the schedule. This was preferable to the disaster that would have happened had the project pressed forward and brought the upgrades live. However, more extensive testing early on would have uncovered the problems and allowed them to be dealt with up front, not in crisis several months down the road.

Land Mine 9: Faith that the system will work correctly and as expected.

Later during the Banner project the decision was made that the university should move straight to web-based registration, eliminating the existing paper-based process entirely. This implied a new process, using new functions based on the new technology. The high profile/high risk nature of the decision made the need for testing obvious, and a skeptical eye was turned on all aspects of the process. Testing was accomplished on several levels:

1. Initial product testing to ensure that the web system worked properly and as expected. Several defects were found and corrected along with several areas in which the product was found to behave differently than expected.
2. The web product required extensive configuration, including the development of instructions and help text for students. This was developed and then tested by having about forty students register on a test system. The students were observed during the process and provided feedback afterward. This allowed another series of problems to be found and improvements made.
3. The technology was then tested to ensure that it could scale and handle the full load of registration and not just a handful of testers. Automated tools were used to simulate large numbers of web users and a number of problems were found and corrected.
4. The entire process was "beta" tested a few days before the live registration by allowing about sixty students to register early.

In the end registration came off with remarkably few problems. What is more important is that each form of testing uncovered problems that would have involved real students and faculty had they not been caught and corrected. This was not unusual – every testing process throughout the entire project brought to light problems that were then corrected.

Only testing can uncover problems in time, and only *process* testing, testing that covers an entire life of a student, employee, and so forth, can ensure that solution is driving the system and that the parts will add up to the whole.

Doing all of the above is a tremendous amount of work. For the people working on the project many other responsibilities are pushed aside so tasks can be completed and checked off. It can then come as a shock to be walking across the campus and, in casual conversation with someone not involved with the project, be asked "so whatever happened to that project? Is anything going on?". It is all too easy for busy members of a project team to forget that for most people on the campus the project was an article in the school paper and that it has since disappeared. Nothing has changed yet so nothing is visible. This is, after all, the stealth phase. But it shouldn't be, at least not entirely.

The challenge for the project team is to communicate what other people in the community should be aware of *before* "go live". With earlier projects at Rensselaer the tendency had been to ignore this, with the result that when changes began to happen many people were caught off guard. Communication, when it happened, tended to focus on the specific items or details, not on the overall project process. With the Banner implementation a different tact was taken and the project steering committee explicitly assumed the task of providing information to the campus community. A communication plan was drawn up outlining what information would be communicated through what means, and when it should happen. People outside the project team were kept up to speed on the progress and the general nature and timing of upcoming changes.

Land Mine 10: "So is anything going on..." Not communicating to people outside the project team what is happening and what they can expect.

Phase 4: Going Live

Going live is the high point of the project. Expectations are high as new things begin to happen and the process of cutting over from the old systems to the new begins. Months of preparation begin to pay off as the new system starts working for real. Ideally months of careful planning and coordination have the system and the process for cutting over perfectly positioned for success.

The reality is not as pretty: "going live" is a crisis and it calls for crisis management. This is different from the project management that moves the project through the earlier stages. Events begin to happen quickly and what counts is the ability to respond. This too must be planned: the tools must be in place ahead of time to manage the crisis. Communication paths and problem reporting mechanisms must be worked out in advance. Most important is a tracking system (even on paper) for handling incoming problem reports. Various approaches have been used at Rensselaer, from spreadsheets to homebuilt software and purchased packages. During the last major system upgrade approximately 200 problem reports were generated during testing and the go-live process. Tracking software allowed each one to be captured and then tracked as additional information was gathered and the problem resolved.

Land Mine 11: Believing that "going live" won't be a crisis.

Then there is the day *after* the system is live. "Going live" is the activity that draws the most attention and planning effort. It is very easy to go too far with this and not spend enough time planning for what happens through the rest of the business cycle. Most of the attention and testing tend to focus on what will be needed immediately after the system is live, ignoring later but equally crucial needs. Again, a whole process perspective is important to help avoid this. What is important is not only that a student can be registered, but that the add/drop process will work smoothly, class lists can be generated, and enrollment reports produced. Downstream the bills will need to be printed and eventually instructors will need to grade. It is only natural that the highly visible initial events will get attention, but problems in any part of the process will rapidly become visible in the worst way.

Land Mine 12: Not planning for the day (week, month...) after the system goes live.

Phase 5: It Isn't Over Yet

Going live is not the end, it is only another beginning. We move from the stage of "going live' to the stage of "firsts", namely, the first time various functions are carried out on the new system. Using the previous example, a student information system might go live with scheduling and registration, but that is then followed by many firsts; add/drop, class lists, enrollment reports, and so on. Each of these requires something new, some additional effort, and they are all bounded by deadlines imposed by the academic calendar. These in turn happen while other functions are still going live, e.g. billing or housing.

This stage can be difficult for the support staff to juggle as project demands run up against the crisis of the day. In this stage support demands are cumulative, at least for a considerable time. It is typical for two full business cycles (semesters, academic years, fiscal years) to go by until support demands drop to a lower steady state. Not that there isn't any fluctuation, but it normally takes going through a process twice to get all of the pieces in place and working properly. The first time through short cuts taken and it isn't until the second time through that all of the kinks are worked out.

The Banner Finance/HR implementation at Rensselaer ran into this problem. The system was phased in with three "go lives" spaced over a year. Each additional function that went live then drew off implementation staff into ongoing support. This was acceptable for the first release (Purchasing and A/P), but after the second release (Payroll/HR) there weren't enough people left to support the third release (G/L, Research Accounting, Budget). The system went live, but work was deferred, leading to cumbersome manual workarounds that only added more work. Resources were focused on fixing operational problems at the expense of other non-critical but important items such as departmental reporting. The result was a large population of unhappy people across the campus and a backlog of work that took eighteen months to dig out from.

Land Mine 13: Not having the people to deal with problems on the "live" system while others are still being implemented.

Phase 6: Upgrades

Once a new system is in place life does not go back to the way that it was. Especially when moving from system that was supported in-house to one that is vendor supported. The good news is that the vendor is continually improving the product and working on new releases. That is also the bad news, at least for people who want to forget about the implementation. The implementation never ends. Each major release is a scaled down version of the initial implementation, calling for attention and involvement from all of the same people. Almost as soon as one completes the planning starts up for the next.

At Rensselaer we have addressed this by largely keeping the project organization intact. It has evolved and expanded, but it has not gone away even as the level of effort has dropped. The hardest part is not forgetting the lessons learned.

So What Does It Mean?

Just a few final observations. Most of the land mines occur early on, with the first five covering events before the project even gets moving and another six applying to activities that go on before anything goes live. This should not be surprising since the land mines refer to the problems with the project itself, not the system being implemented. It is during the early phases that the project itself is defined and conversely, is most susceptible to problems. Beyond that, once a problem occurs it will not go away by itself. It won't be solved without deliberate and sustained efforts to correct it.

The good news is that the land mines are avoidable. None of them are problems so obscure that they can't been seen and avoided. The key is making the effort to look and avoid. While I am sure that there are other land mines out there, avoiding these will move any project a long ways towards a successful completion.

Figures and Tables

Phase	Description
Foundation	The project is defined and high level decisions made about the solution and the resources required to implement.
Getting Started	The project starts, people are organized, and more detailed plans are made.
Stealth	The project has high levels of activity but is not visible to people not immediately involved.
Going Live	Operations begin moving over to the new system.
It isn't over yet	The project continues bringing functions live until every business event has happened at least once.
Upgrades	The project is done but the work continues on an evolutionary basis.

Figure 1. Six Project Phases

Project start-up tasks	Implementation Tasks
Building the project organization – committees, work groups etc. Staffing the project Adding detail to project plans Technical training Long term planning	Finalizing contract Procuring hardware and software Installing a system for testing & training Analyzing business processes and starting change

Figure 2. Project start-up tasks versus implementation tasks.

Land Mine Summary
Land Mine 1: Assuming that choosing a system is the same is defining the project.
Land Mine 2: "The Squeeze". Overselling and underfunding the project in an effort to secure approval.
Land Mine 3: "The land that time forgot". Not allowing time to get the project started and the team in place.
Land Mine 4: "The schizophrenia of startup". Not dealing with both long term planning AND the short term issues of getting a project in motion.
Land Mine 5: "Breaking the chain". Technical training > skilled support staff > training system > product training > business decision making.
Land Mine 6: "I love you, tomorrow..." Procrastination.
Land Mine 7: Letting the system block the view of the solution.
Land Mine 8: Assuming that the whole = sum of the parts. Maybe it is, but maybe it isn't.
Land Mine 9: Faith that the system will work correctly and as expected.
Land Mine 10: "So is anything going on..." Not communicating to people outside the project team what is happening and what they can expect.
Land Mine 11: Believing that "going live" won't be a crisis.
Land Mine 12: Not planning for the day (week, month...) *after* the system goes live.
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Abstract

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ID Number:	EDU9920
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Author:	Bruce Sheppard, Wilbert Boone, Ken Stevens
Organization:	Memorial University of Newfoundland
Year:	1999
Abstract:	This paper reports on a case study of one rural school that has been recognized as an innovative school in respect to the integration of information and communication technology (ICT) in the teaching and learning environment. This case study is part of a larger study to assess the impact of two outreach projects directed at the implementation of ICT in K-12 classrooms. Findings suggest that while the outreach projects have positively influenced the implementation of ICT, the factor that distinguishes this one school from other less successful project schools is their collaborate model of leadership.

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Information Technology, Innovation and Success in a Small Rural School

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Abstract

This paper reports on a case study of one rural school that has been recognized as an innovative school in respect to the integration of ICT in the teaching and learning environment. This case study is part of a larger study to assess the impact of two outreach projects directed at the implementation of ICT in k-12 classrooms. Findings suggest that while the outreach projects have positively influenced the implementation of ICT, the factor that distinguishes this one school from other less successful project schools is their collaborate model of leadership.

Paper Presented at EDUCAUSE'99, *Celebrating New Beginnings*
Long Beach, California, October 27, 1999

This paper reports on a case study of one rural school, Genesis Academy (a pseudonym), in Canada's most eastern province, Newfoundland and Labrador. Genesis Academy has been recognized as an innovative school in respect to the integration of information and communication technology (ICT) in the teaching and learning environment. This case study of Genesis Academy is part of a larger study that is focused on the assessment of the impact of two outreach projects on student learning and the development of ICT. The first project, STEM~Net, was initiated in 1993 by the vice-president of Memorial University of Newfoundland. Its goal was to design and develop a province-wide computer network for all k-12 educators in Newfoundland and Labrador. STEM~Net, still in operation, was a founding member of the second project, SchoolNet, which was established by Industry Canada in partnership with the provinces and territories. SchoolNet operations in Newfoundland and Labrador are essentially managed through STEM~Net and its goal is similar. This paper will describe the influence of STEM~Net and SchoolNet on students and teachers, the technology infrastructure and resources, the classroom use of ICT, and the approaches to professional development and leadership that have contributed to successful implementation.

The researchers conducted this study in the context of the considerable evidence that investments in innovation and change in schools rarely result in prolonged success, particularly if the initiative originates at the university or government level (Cranston, 1994; Deal, 1990; Fullan, 1993, Sarason,1998). For example, in 1990, Deal stated, "We have tried almost everything conceivable to improve our public schools. We have invested millions of dollars...only to watch new skills disappear amidst old routines" (p.6). Sarason echoed Deal's lament in 1998 by asking, "Why has the expenditure of scores of billions of dollars had such disappointing consequences?" (p. xii).

In contrast to these images of failure, the school described in this case study, despite many limitations, has been successful and can provide a number valuable lessons for those who wish to bring about meaningful change through the integration of ICT in teaching and learning environments. The research team determined the level of the school's success on the basis of cross case analysis of the data collected from 15 schools that were investigated. Of all the schools, we determined that this school was the most innovative. The validity of our selection was subsequently substantiated when, through a process completely independent of our research, this school was selected as 1 of 24 innovative schools in Canada.

Methodology

Data were collected over the course of six months through the administration of two surveys related to professional learning and school leadership (Leithwood, 1995a, 1995b), a three hour focus group meeting with all the staff, a presentation by the school technology team, a review of the projects that the school had placed on their Internet site, and a three-day visit to the school. During the three-day visit, data were gathered through field notes of observations and through semi-structured interviews with the principal, teachers, the technology teacher, the teacher-librarian, and students. Teachers were chosen according to the following criteria: a teacher known to be active in the integration of ICT in instruction, a teacher recommended by the principal, and a teacher chosen by the researcher at random from the faculty list. Three groups of students representing grade levels (primary, elementary, intermediate and high school) were interviewed. At least one of these groups had experience in the use of ICT in their learning. The other two groups were chosen at random from class lists. In addition to the data gathering at the school, the researchers interviewed four members of the STEM~Net and the SchoolNet projects: the director and the senior training officer of STEM~Net, and two coordinators of SchoolNet programs.

A variety of methods were used to analyze the collected data: constant comparative method, theoretical memos, clustering of conceptual groupings and corresponding matrices (Glaser & Strauss, 1967; Miles & Huberman, 1994; Strauss & Corbin, 1994). Data were coded by two researchers to insure inter rater reliability of the coding. Some codes were developed deductively on the basis of the current related literature related to the learning organization framework that guided the analysis. Other codes were developed inductively during the process of interviews on the basis of field notes, and yet other codes were added during the analysis as the researchers uncovered unexpected themes (Miles & Huberman, 1994; Potter, 1996).

The Outreach Projects: SchoolNet and STEM~Net

SchoolNet is a collaborative initiative of the Government of Canada through Industry Canada, the provincial / territorial ministries of education and the private sector. Its goal is to facilitate access of Canada's schools and public libraries to the Internet. This national education network, which consists of the provincial and territorial networks was officially announced in 1993. One aspect of SchoolNet participation with the provinces and territories and the private sector has been through STEM~Net in Newfoundland and Labrador. STEM~Net was established in 1993, as well, and has established a presence in Newfoundland and Labrador through teacher e-mail accounts, curriculum workshops, and annual provincial technology conferences. Essentially, STEM~Net acts as the local SchoolNet representative in Newfoundland and Labrador and manages and coordinates most of the SchoolNet projects in the province. While SchoolNet and STEM~Net are involved in a number of specific programs that relate to their overall mission which is to ready learners for the knowledge-based society through the creation of educational resources through information technology, there currently exist two major initiatives that have had a major impact upon our study school: the SchoolNet GrassRoots Program and the SchoolNet DirecPC Satellite Program.

The SchoolNet GrassRoots Program is a national program that provides financial assistance to K-12 schools for the creation of innovative and interactive learning projects on the Internet linked to curriculum outcomes. These projects are intended to foster the acquisition of academic, employability, and computer skills in Canadian youth; build unique and relevant Canadian content on the Internet; integrate information and communication technologies into learning; and facilitate increased connectivity and training opportunities.

All K-12 teachers are eligible to submit project proposals. The main sources for teacher awareness of the GrassRoots program appear to be promotion by STEM~Net through district representatives, e-mail, and annual awareness conferences. Some awareness occurs through the STEM~Net web site. STEM~Net personnel also provide direct support to teachers in writing GrassRoots proposals. If the project proposal is accepted, it is funded according to the following categories: Category A ($300), Category B ($600), or Category C ($900). In order to receive the funding, the project must be developed as a shareable resource that is published on the Internet. The financial assistance associated with the development and completion of a GrassRoots Project is perhaps, the primary reason why many teachers participate.

The second SchoolNet initiative, the SchoolNet DirecPC Satellite Project, has proved to be an essential component related to connectivity that has allowed the implementation of ICT at our case study school to progress. Schools in Newfoundland and Labrador are connected to the Internet through either a cable modem, an Asymmetric Digital Subscriber Line (ASDL) connection, a DirecPC satellite dish, a cable point-of-presence or a Serial Line Interface Protocol (SLIP) telephone line connection. In the case of small rural schools such as Genesis Academy, STEM~Net, in partnership with the school district and a private telecommunications corporation, has made available the SchoolNet DirecPC Satellite program . This program provides to the school a 400 Kbps DirecPC [in] and a 33.6 / 28.8 /14.4 Kbps SLIP [out] through long distance dialling. Also, STEM~Net has supplied rural schools with a toll-free number and 30 hours of long distance service per month paid for by the provincial department of education. In spite of this, the most common problem associated with the SchoolNet DirecPC Satellite program in our case study school, as in others is the costs incurred for upload time through the modem connection.

Genesis Academy

The Infrastructure and Resources

Genesis Academy is a K-12 school with 275 students and 19 teachers including the school principal. It serves all students from seven rural communities in Canada's most eastern province, Newfoundland and Labrador. The school building, a 30 year-old wooden frame construction, is not modern or conducive to innovation. Essentially the building consists of a series of classrooms and a gym--a design that the principal describes as "meant for the curriculum in 1968."

In terms of ICT infrastructure, resources have been somewhat limited. Until September 1998, with the installation of DirecPC Satellite, Internet access was restricted to one telephone line allowing access from only one computer terminal at a time. This Internet access was provided through STEM~Net through a modem pool accessible via a toll-free telephone number. Students now have access to the Internet through 18 workstations simultaneously.

While the installation of DirecPC Satellite is a major advancement, the school, and in fact the entire region, is restricted by an inadequate telecommunications network serving their region. Internet access is available only through long distance using analog technology. Also, a recent change in long distance rates that provides for unlimited long distance use at a predetermined rate has resulted in traffic congestion, thereby, compounding telecommunication difficulties. In spite of the positive attitude toward the support that they have received, those interviewed remain quite frustrated with the level of Internet connectivity that they have been able to achieve. They would like to be able to hook up all classrooms, the library, and the administrative offices to the Internet. At this point they have not been able to identify potential funding sources for these visions, nor have they been able to obtain a commitment from the sole telecommunications provider to upgrade the telecommunications infrastructure in the region.

In addition to frustrations related to the limitations imposed by connectivity, those interviewed also highlighted concerns related to the lack of computer equipment and limited teacher time for professional development, instructional planning, and project proposal writing.

All teachers and students complained of the difficulty gaining access to the computer lab. With only one lab with 18 computers to serve all classes, the inadequacy of the resource is obvious. The current situation dictates that priority is given to grades 7-12 students who are completing courses that require access to the lab. Any time that is available beyond those scheduled courses is shared with all others. One high school teacher noted that the GrassRoots project that she and her students did last year was done entirely as an after-school project because access to the lab was not available during the school day. The following comment by the school principal reveals the frustrations surrounding this issue of computer equipment:

> That gets back to my first point, the financial resources in order to keep up with it. Where things change so much, it's hard to justify putting a lot of money into anything. In two years time, it's going to be rendered useless and you can't sell it. If it was something like a glass backboard for basketball that you can keep there, that's perfect because you got something to show for your money. When you invest $2,000 in a piece of equipment, and in two years time it's out in the AV room collecting dust, that's not a wise way to be spending--I don't think it is. You're in between a rock and a hard place. You want to move along with technology, but yet you have limited financial resources that you can put into it. What do you do? If they're going to outfit big schools with these big new labs and everything like that, then I think every school should be fitted out. They want technology in the school but they're not giving us the resources to do it.

While the level of support that the school has gotten for their various fundraising activities has encouraged the school's technology committee, they realize the limits of such endeavors in the context of the enormous outlay of funds required to provide the necessary computer resources. Businesses have been generous in providing used computers through SchoolNet's Computers for Schools program. These computers still have functional value in respect to various basic learning outcomes. The school board has provided several funding schemes to encourage and reward local efforts in this regard; however, the pace of change in computer technology continues to place an increasingly heavy burden on their budgets as well. The Department of Education provided resources to support the introduction of several communications technology courses at the high school level. This funding allowed the technology committee to purchase specialized equipment such as video editing equipment and a scanner. A targeted federal Government employment program, Bridges, has also provided needed human resource support. In fact, the person hired through the Bridges program works as a computer lab assistant and is viewed by some of the primary students as a teacher. All students noted the assistance provided by this person. The technology resource teacher felt that she would have been restricted in some of the support that she could offer without the support of the person hired through the Bridges program..

The principal, while anxious not to downplay the learning benefits to students, noted that a primary benefit of the GrassRoots projects was the funding that came with them.

> I'll say to you, GrassRoots programs are great and the kids learn a lot, but the benefit is to the students also in terms of money that comes in.

A high school teacher who has been heavily involved in GrassRoots projects expressed a similar sentiment:

> Another reason for the Grass Roots projects is for the money that goes back into the school. So you know you're not only doing it for the students, but there's this monetary value that comes out of it at the end. That's really important to the school and to the computer lab.

Considerable extra time, beyond normal routines, is required of teachers who are developing lessons using technology or engaging in special GrassRoots projects. Even more time is required of the technology resource teacher. At this school, several of the teachers referred to themselves as Internet addicts. The limitations imposed as a result of equipment shortage and poor connectivity contributed to the additional time that teachers were spending with students after classes and in the evenings. The school board has recognized the significant contribution of time given by the technology resource teachers, but there is no apparent recognition of the significant time expenditures of others. While it is reasonable to expect that professional teachers work with their students and engage in learning and planning outside of the student school day, it appears that much of the program that led us to designate this school as an innovative school is largely dependent upon volunteerism.

Leadership

The model of leadership that appears to exist at this school is consistent with models that are currently viewed as being most appropriate for successful educational change (Darling-Hammond, 1996; Fullan,1998; Hargreaves.& Evans,1997; Leithwood and Duke,1998; Leithwood & Jantzi, 1997; Leithwood, Leonard,& Sharratt, 1997; Mitchell, Sackney & Walker,1996; O'Toole, 1996; Sheppard, 1996; Sheppard & Brown, 1998). Emphasis is placed on cultural, collaborative approaches in which teachers and other educational stakeholders are viewed as partners. In such a model the school administrator is actively engaged as a facilitator such that the leadership capacity of others, particularly teachers, is enhanced. Essential components of such an approach to leadership include staff involvement and commitment, community partnerships, and the building of the school's capacity to maintain or improve performance based on experience. At Genesis Academy, 81% of the teachers viewed the principal as providing a great deal of leadership for school change. However, they also recognized the leadership role of others, as well. Approximately 60% of the teachers recognized that leadership was distributed among teachers that were assigned specific roles such as membership of the school's technology committee. Additionally, 67% perceived that a great deal of leadership was exercised by the entire school staff. 62% perceived that students were leaders in the school and 20% recognized the leadership contributions of various community groups and school district office personnel. While the school principal admits that he has not had direct involvement with projects or initiatives related to ICT, he has been supportive, and he notes that the success of ICT implementation at Genesis Academy is dependent upon team leadership that exists within the school.

The following comment is indicative of the principal's support for technology in the school:

> I see technology playing a big part and will continue to play a big part in changing how people live. We have absolutely no control over that. If it's going to happen, it's going to happen. You can battle it and say I'm not going to do this and I'm not going to do that, but the more you battle the further behind you'll go. It's a fact of life, you hear a lot of people say about how things were better back then and this kind of stuff and most likely in their eyes, they're absolutely right. But technology is going ahead and to keep up with it, we're going to have to put some effort into it. It's no question about that.

This support has not translated into the principal's direct involvement in the promotion of technology. However, it is quite clear that he is aware of the progress that has been made in this area. He attributed much of the progress to the expert leadership of the technology resource teacher, and he appeared to have confidence that such leadership will continue:

> All students and teachers recognize the leadership provided by the technology teacher. She is responsible for providing the technical advice, professional development to teachers, and community training to parents and other community members. She chairs the technology committee that is responsible for setting directions for ICT progress in the school.

When asked about scheduling classes in the computer lab, something about which he had expressed considerable concern because of limited resources, he revealed his absolute trust in the leadership ability of the technology resource teacher:

> We usually try to maneuver the schedule such that we will make an excellent school. And I have nothing to do with it again. I'm just talking from an administrative point of view. Our technology person, she's very accommodating in terms of.... If she's sees people wanting to use technology as an instrument to supplement the text or whatever, she'll certainly bend over backwards to make sure that she got the proper software installed and that kind of thing so that everything is ready to go.

The technology resource teacher verified that she has been assigned a leadership role in the school and that she has further distributed that role to a team of teachers:

> I am the leadership in this school, which is great because somebody needs to be the leader. But once the technology committee was formed then it took a lot of pressure off me because I

> knew I wasn't making the decisions, but I was before that because the principal gave me free reign really, not free money, but free reign. So, all the decisions were mine. So, we [the technology committee] do meet fairly regularly. Sometimes they're not formal meetings because sometimes I just have to go around and say this is an issue, "What do you think?" Sometimes they're informal. We make decisions about purchasing and about raising money. We have our own bank account and we make decisions about approaching the board. We don't purchase anything, without having two people to sign on our account.

One of the technology committee members confirmed that the principal's confidence in respect to the leadership strengths of the technology resource teacher is well founded:

> She has been exceptional in the leadership role with our technology. She was very, very interested in it and wanted the school improving technology and she's brought it step-by-step. She lived and breathed it and just about slept in the school in the technology lab. It's more than just a job to her and she loved it. She's not doing something that she hates to do, she really loves it and she spurred it all on. So, she formed it and got the committee off the ground.

Student leadership is also emphasized in this school. As noted above, 62% of the teachers felt that students provided a great deal of leadership in the school. The principal praised the active role of the student council. The principal was quite eager to talk about the student leadership group that he referenced as "an arm of student council". This group has been active at the provincial level and hosted a provincial leadership conference two years ago. The principal is convinced that students are comfortable discussing school issues with him and that they have extensive input into school decision making.

The grade 12 students that were interviewed felt that the all-grade school environment provided unique leadership opportunities for all students. For example, they noted that the school has an established tutoring program that allows high school students to tutor elementary or junior high students. This program provides leadership opportunities for the high school students and needed assistance to the tutored student. Also, tutors are paid a small fee that is to go toward tuition costs related to their post-secondary studies. Finally, teachers and students recognized the significant leadership role played by a number of students in the professional development of teachers in respect to ICT.

The school council composed of teachers, parents, students, and community representatives is also quite active in school leadership. In reference to technology, they are leading the lobby to have the telecommunications infrastructure up-graded in the school and the region.

The school board's leadership has also had a favorable impact upon technology implementation at Genesis Academy. They have supported the implementation of ICT across the curriculum by making it an essential goal of their strategic plan. Also they have accepted the recommendation of the district committee on technology to formally recognize the position and title of *Technology Resource Teacher*. Even though the Department of Education has not formally recognized such a position for bonus salary purposes, the school board has agreed to support the position through recognition and through some other small rewards such as professional development opportunities that they can provide. The technology resource teacher at Genesis Academy is chair of the district committee on technology, and she praised the school board's decision in this regard:

> So, we wanted to at least say that we know you're there and we recognize you and we appreciate your leadership role.... They're recognizing it, that's as far as they're going right now, and they're also trying to provide little things. We're even hoping to choose a few teachers to attend some national conferences and things like that. So, there are things that we can't do, like to grant department head status with pay increases and things, but there are other things that we can do and we are trying as a committee at the District level to try to do the little things. Just the recognition alone makes some people feel better.

The principal believes that the school is well connected to all the communities that it serves and is viewed as the hub of all activities for students. This view was supported by one of the teachers:

> We are the social fabric and fibre of this whole [regional] community. So, it gives opportunities for things that aren't normal in urban areas and aren't normal even in small different rural areas.

As a result of the leadership role that the school plays in the community, it receives a great deal of community support. For example the grade 12 students recognized that,

> the community gets really involved in the school. Take the Gym for instance, everything, like the backboards and the oak paneling, was done through a group out here called the "Basketball Moms".

The students also noted the support provided by the public library:

> We work with the public library.... The librarian brings in books or articles and stuff that we can use in the school.

In addition to the recognition that school leadership was distributed throughout the school and the community, all groups interviewed also noted the positive energy generated through the existence of a collaborative environment. The extent of the collaboration between teachers and students, and the reliance upon student leadership in respect to learning as it relates to technology are revealed through the following student comment:

> Mary was sitting down to a computer, and Mr. Paul was there. He was looking to get into a certain program, or he was wondering what was going on, he leaned over and he asked her for help. So, when it comes to computers, they don't always see themselves as experts.

A senior high school teacher corroborated this view that a collaborative environment exists at Genesis Academy:

> I think all staff members work together tremendously. You can always find a lot of teachers to pull together and help you no matter what you are doing.... The whole staff without hardly any exception takes part, and everyone pulls together.

Morale at the school appears to be rather high among students, teachers, and the community in general. The grade 6 and 7 students were proud of their school. They boasted that they were well known as leaders in Basketball. Also, they were aware of and were quite proud that many students received scholarships in their school. A grade 12 student stated that she had attended five other schools in other areas and that Genesis Academy is the best. "Everyone gets involved and teachers and students have a good relationship." A teacher echoed the same positive thought: "This is an exceptional school. I love to come to work every day." The principal was also proud to be associated with this school and felt that morale was quite high:

> I know we get along very well. We give each other a hard time a lot, which is a good sign really, in that you could joke around and you could play around and that kind of stuff with everybody. A lot of people are involved in different things. A lot of teachers are certainly involved in the whole idea of student participation. There are extremely good students in here in this school in terms of student leadership and that makes it much easier for discipline. It makes it much easier for teachers to get the work done. If they wanted to sponsor a particular activity then it's no problem for students. Students are there to get the job done.

The grade 12 students were quite enthusiastic about the relationships between teachers and students in the school. One student commented:

> It's not one sided. They're not just our teachers. The same thing exists if we meet them outside of school. It makes you feel that much better about going to a teacher and asking for help.

They were pleased to describe examples of their teachers' active engagement in school activities beyond the classroom, such as playing volleyball with students and engaging in Christmas frolics, or Spring Fest activities. One student described the following as typical of school life:

> At the Spring Fest last year, we had one of our teachers, Mr. Jones. When he entered the gym, students went up to him and they bombarded him with water balloons and then he took off and they ran after him. That's what our teachers do; they get involved, too. It works both ways. That's the way our relationship is with teachers here.

The Integration of ICT in Teaching and Learning

Ninety-five percent of the teachers believe that ICT is having a significant impact on the students' learning activities. The importance placed on ICT for all students is further demonstrated by the composition of the membership of the technology committee that insures representation from all areas of the school from kindergarten to grade 12. This committee has had a formal written technology plan related to student learning outcomes since 1996. They have met each year to evaluate their progress relative to that plan and to formulate new plans. The grade 2 teacher reported that all projects that she planned for students, including GrassRoots projects, were consistent with the school's and district's articulated learning outcomes. One basic objective related to computer technology is that all students will begin word processing in grade 2 and will develop appropriate skills throughout the grades. The technology resource teacher reported that by the time that students complete grade 6, the majority, perhaps as high as 90% can type 20 words per minute. All grade 10 students are expected to complete their examinations using a word processor.

All primary and elementary classrooms have several computers. These are older computers (286's and 386's) that have been donated through SchoolNet's Computers for Schools program. They are used primarily as writing centers. In addition to scheduled writing center learning activities students can use these computers during class time when they have completed other work, in the morning before class, and during recess and lunch breaks. Additionally, all students from kindergarten to grade 12 are scheduled in the computer lab. Junior and senior high students are scheduled regularly in the computer lab for courses directly related to the development of technology related objectives. Additionally, they are scheduled specifically for units of study in other subject areas such as mathematics, science, or language. The technology resource teacher perceives that, currently, up to 90% of the teachers are interested in integrating technology across the curriculum; the biggest drawback to that, she observes, is their getting access to the lab. While she believes that another lab would be of significant benefit to the cause of advancing ICT, she expressed a concern that placing more computers in classrooms may not be the correct approach. The technology committee placed computers in junior high classes, but these were not used effectively.

The importance of ICT to students was clear. For example, when asked what changes they had noticed in the last few years the first response from the grade 6 and 7 students was "Our gym is bigger." The second response was related to the remodeling of the computer lab so that now "there's Internet on every computer." To place second only to the gymnasium, the home of the school basketball team, that has shaped the school's identity, is quite significant. The importance of the change was further demonstrated by the fact that all students were aware that this improved Internet connectivity resulted from the installation of the satellite dish at the beginning of this school year. Several of these students indicated their enthusiasm for using the Internet as a tool for learning. One student commented, "I love the Internet." A second student stated, "The Internet is good to get lots of information." Similarly, the grade 3 students were quite excited about their active engagement with the Internet and were anxious to talk about it. The enthusiasm for their work was evident from the degree of energy created as they shared accounts of their last years work on the Grassroots projects on fairy tales, dinosaurs, and bears. One student commented,

> We did all different kinds! We made up our own fairy tales and we passed it along to other schools and our teacher. One school was from Mexico.

They had exciting ideas about the projects that they wanted to pursue this year. One student wanted to develop a web site about the Internet itself, another wanted to search the web to find out about orcas, and yet another wanted to learn more about the Titanic. Another student excitedly stated that,

> There are thousands of things that I would like to look at, like the Titanic, hear your heartbeat and all that stuff.

The GrassRoots program has played a significant role in integrating ICT into the students' curriculum at this school. Over two school years, the school has had eight GrassRoots projects sponsored by various teachers at all grade levels. In response to a question related to awareness of GrassRoots, one grade 12 students stated,

> Oh definitely. You should hear my cousin telling me about how they did it with a whole class and one Internet.

Technology is becoming institutionalized in this school. The principal stated:

> Well, what I'm finding is that it's just becoming one of these things like reading and writing now. I find technology is just becoming one of these things that kids are just doing, like it's no big deal to them.... It's like everything that's introduced to a curriculum that evolves into something that eventually just becomes part, it's like the French program or the English program or like anything else-- it just becomes part of you and it's available to everybody.

The degree of integration of technology into the school environment is further revealed through another of the principal's observations:

> At one time [there were] students who loved to get in the computer lab to see what kind of a mess they could make on the hard drives and stuff like that, whereas, now they got a whole new respect for it. Now they see it as a tool that they can actually use, now there is no idle time. They go in there now and there are things that they can do with a computer, so why mess it up.

Not all schools have progressed to the level of this school. In many schools, one of the primary reasons for not providing students access to computers and the Internet outside of scheduled classes is the potential for vandalism. At Genesis Academy, students have access to computers throughout the entire day and many evenings. At these times students can play computer games or work on an assignment. If access were restricted to scheduled classes then it would be limited because one computer lab serves all students. The principal noted that,

> you almost need a note from God if you want to get in there very little during the day.

Professional Development

Professional development activities that have influenced the implementation of ICT at this school includes: training provided through the Federal Government Bridges program; just-in-time on-site support and short courses provided by the technology resource teacher; continuing education opportunities offered by various post secondary institutions; training, support, institutes, and conferences offered through STEM~Net; district and Department of Education planning teams; and workshops for adults and children sponsored by various groups.

The technology resource teacher has acquired skills in technology as a result of a variety of experiences: courses at a public technical college, a technology education graduate degree program at Memorial University, a week-long summer institute sponsored by the Department of Education, an information communication technology conference sponsored by STEM~Net, and membership on provincial and district technology committees. Working with the technology committee at the school level, she and other team members have encouraged others to get involved, and she has followed up by providing short courses and just-in-time training for teachers as required.

The grade 2 teacher described the professional development program that got her interested in computer technology. She was asked to assist a district program coordinator in the delivery of a technology summer camp for primary children. She learned a great deal at this camp, and has been able to build on her enthusiasm and newly found skills through courses offered by the technology resource teacher. Also, she and two of her colleagues have recently had the opportunity to attend a week-long Windows NT course sponsored by her school board.

STEM~Net has played a major professional development role in the area of computer technology. Aside from the train-the-trainer model that STEM~Net has employed, whereby each school was to have one trained resource person, two teachers reported that simply being given an Internet account and free Internet access gave them the resources that they needed to learn. The support offered through the STEM~Net team has been invaluable to several of the teachers in this school. The introduction of GrassRoots has generated the critical tension and the experience required for more professional learning to occur.

As a result of the Bridges program, teachers, school children, and adults have been able to avail of free training. A grade 12 student described the observed success of the Bridges program:

> There's a class after school for parents and children who want to get familiar with the Internet. It works out pretty well. Almost every evening, you'll see the Moms and the Dads sitting down with the children and they seem to like it, too. I think there was a course for teachers. My Mom has done about three courses here after school or in the evenings. And the same thing exists for teachers who might be interested in different areas of it. I guess some of the primary teachers aren't really as much concerned about big, heavy-duty things. They want programs for their students and they'd like to know what Internet sites are good for their students.

The technology resource teacher summarized the importance of professional development quite forcefully:

> I believe that teachers can't expect students to use technology if they don't use it themselves. I believe teachers must be role models to use the technology. So, that's certainly something. So, providing professional development even if it's psychological professional development has to be the number one priority of the Department of Education in my opinion. So, like from a SchoolNet point of view for example, the more things that they can do the better, because once you hook them, you have them for the most part as long as you don't overwork them. But if we're talking about most teachers out there, you just need to hook them and whatever you could use to hook them means you'll hook their students.

Summary and Conclusions

The researchers found that individuals at Genesis Academy were unable to make a distinction between STEM~Net and SchoolNet programs. The groups associated with these two programs have developed a seamless service that have had a positive impact on teaching and learning at all grade levels at Genesis Academy through initiatives targeted at students and teachers, the improvement of the technology infrastructure and resources, the classroom use of ICT, and the professional development of teachers.

At Genesis Academy, connectivity continues to be a source of frustration; however, the SchoolNet Direct Satellite Program has resulted in major improvements in that regard. Also, the toll-free long distance connections make connectivity somewhat affordable. As a result, teachers and students have been encouraged to continue their efforts toward further integration of ICT in the classroom.

The GrassRoots program has provided an incentive for the development of instructional units that have facilitated increased teacher and student use of ICT in the curriculum. The financial rewards provided to the school for engagement in GrassRoots projects have allowed the school to add to their ICT resources, and the support and professional development opportunities provided by STEM~Net and SchoolNet personnel have been major positive influences.

In contrast to other less successful schools that also had the SchoolNet and STEM~Net supports available to them, Genesis Academy appeared to seize opportunities to avail of any sources of leadership available. As a result, the successful implementation of ICT into the teaching and learning environment at Genesis Academy appears to have been positively influenced by the collaborative leadership model that has been fostered. Teachers, students, parents, school administrators, school district personnel, community members, businesses, STEM~Net and SchoolNet personnel have been involved in both the planning and implementation of ICT integration into the teaching and learning environment. While the leadership provided by technology resource teacher was invaluable to the successful development and implementation of innovative ICT projects that impacted the learning environment, she was quite emphatic that the success of her efforts were largely dependent upon the collaborative leadership environment and support of the above noted groups. Certainly, a significant lesson of this case study is that large scale university or government initiatives can have a major impact on the use of ICT in teaching and learning environments in schools if leaders of these initiatives engage with other school and school system leaders to deal with local issues and concerns and if all are willing to adapt strategic plans as a consequence of successes, failures, and the unexpected.

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Organization: University of Plymouth

Year: 1999

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Integration of Digital Satellite and Terrestrial Networks for Education and Training

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Abstract

The University of Plymouth has developed an integrated digital networking infrastructure for voice, video and data throughout the region to deliver a variety of education and training programmes. This session will describe how the infrastructure has been implemented using a novel combination of ISDN, SWAN (a regional ATM network) and digital MPEG2 satellite broadcasts from the University's uplink. It will discuss cost benefits analysis in terms of low cost, wide access and quality and will describe such uses as research seminars for health care students, across distributed campuses and training of surgeons in the region's hospitals using live, interactive digital satellite TV.

Introduction

The University of Plymouth is a large institution with over 20,000 students and is engaged in higher education, consultancy and research. The University is located in the South West of England and covers the counties of Cornwall, Devon and Somerset, comprising several campuses separated at its widest point by 300 kilometres of mostly rural area (Figure 1). The University has developed a reputation for the delivery of distance learning courses using telematics technologies, including live, interactive broadcasts from its own TV studio and a TDS4 satellite uplink transmission facility on loan from the European Space Agency (Winders 1993).

These broadcasts offer interactive opportunities through the use of audio conferencing and ISDN video conferencing to enhance the learning experience of remote students. More than 800 live TV programmes have been transmitted since 1989 (Winders & Wheeler, 1997). The University's Satellite Research Centre has developed a sub-carrier data transmission system, which can deliver computer data at 128 Kbps simultaneously to distributed PCs, each equipped with a data capture card. Each PC capture card has a unique electronic identity, which enables selective transmission of data. This provides a high security facility for delivery of sensitive content and enables course material to be distributed only to bona fide recipients. This technique was originally introduced for wide band FM (analogue) broadcasts, and has recently been developed for transmissions incorporating MPEG2 digital video compression. This results in the cost advantage of reduced satellite rental charges, since as little as one-eighth of the satellite transponder is required (Glover, 1996). In practice, this translates into an 80% reduction in transponder costs, which is a considerable saving.

The use of these satellite transmission techniques combined with computer and communication technologies has enabled the University to pioneer a number of innovative regional, European and global telematics projects. Key projects are illustrated in this paper to demonstrate how these technologies are integrated to provide effective distance learning. The paper describes how the University of Plymouth has played the leading role in establishing a regional network infrastructure in support of its distributed campuses and sites across the counties of Cornwall, Devon and Somerset. In particular, developments in integrating satellite and terrestrial networks are illustrated using the key projects described herein.

Development of a Regional Infrastructure for Distance Learning

There are several issues that must be addressed in order that an effective, integrated regional network infrastructure can be implemented. On the practical level there are technical and physical considerations to be made in providing the services that the users need, but in a situation where the communications technologies available are rapidly changing. At a strategic level, distribution and integration of services must be carefully planned in an environment where regulations that apply to networking connectivity are changing. On the political level, the need for collaboration with key organisations and agencies is a key part of implementation.

The University of Plymouth has strong regional connections with other higher and further education institutions, with health care organisations, local government agencies and with businesses. In addition to the need to support a distributed campus structure it is important for the University to strengthen the links with these other key regional bodies. There are restrictions on connectivity between educational networks and local government or health services networks. This is largely for security reasons to respect personal confidentiality. There are regulations on the SuperJANET educational network, which links universities and higher education institutions, that restrict connectivity to non-educational organisations, such as businesses. Indeed connection to SuperJANET for further education colleges has only recently been allowed. Connection of schools to SuperJANET is not implemented at present. Integration with public networks, for example ISDN must be considered along with alternative networking technologies, for example, satellite TV/data broadcasts.

The University of Plymouth has, for nearly 10 years, enjoyed exclusive access to the TDS4b digital satellite up-link on loan from the European Space Agency. During the last three years additional, valuable experience has been gained in broadcasting MPEG2 digital TV transmissions via Eutelsat W2, the satellite used in the present study, which has a footprint covering Europe and beyond. In the last five years the University of Plymouth has been the lead player in establishing over 35 regional community telematics training centres, along with SWAN, the South West Area Network, which provides a high bandwidth regional educational networking infrastructure (Figure 1).

In addition, the University's Institute of Health Studies has established learning centres for nurse education in the region's hospitals (Vranch and Wheeler, 1997b) although these centres are not connected to SWAN, since this could compromise the security of the NHS network and confidentially of patient records. There are distinct advantages in using live digital satellite technology in terms of its superior audio and visual quality, high security and low transmission costs compared with delivery technologies that use solely terrestrial networks. In particular, delivery of course materials via satellite into hospitals can be achieved without compromising the security of the NHS network, since no network connection is necessary. A return path for interactivity can be made via ISDN2 video conferencing, telephone or fax, again without compromising network security. The video conferencing return path can be used for trainees to ask questions directly to the studio presenters or to bring in an expert lecturer from a remote location as a contributor to the live session. In both cases the video conferencing image appears live as a window within the TV screen.

Examples of Distance Training and Education Initiatives

The following sections describe a number of key projects that illustrate the development of the current regional network infrastructure and give examples of technologies that have been used to provide appropriate services for distance learning.

The WIRE-Mediaspace Project

The WIRE - Mediaspace project delivered a distance learning course in Multimedia to Euro Study Centres in European universities (Vranch et al, 1997). WIRE (Why ISDN in Research and Education?) used a powerful combination of terrestrial and satellite services, including audio and video conferencing, computer mediated communications and electronic mail, to support the learning process. Feedback from students in the use of all these technologies has previously been very positive (Hilton, 1996; Emms and

McConnell, 1988; Ackermann, 1996, Huckle, 1996). These studies each used a limited number of combined technologies, unlike WIRE-Mediaspace, which employed several technologies in delivery of one course.

In the WIRE-Mediaspace project, with its focus on ISDN, particular attention was paid to combining ISDN video conferencing, ISDN file transfer and ISDN remote access techniques with the technologies of live satellite TV, WWW server and FirstClass electronic conferencing. The aim of the Mediaspace course was to use these technologies to mirror the functions of firstly the "keynote lecture", and secondly seminar/tutorial support sessions - with the emphasis in both cases on providing interactivity at a distance. This was to be achieved in the former by a series of monthly live satellite broadcasts and in the latter by FirstClass electronic conferencing. This was accompanied by ISDN video conference and remote access and file transfer sessions - especially for the development of joint multimedia projects at a distance. The WWW server provided further links to other relevant Web sites and access to files used in the transmissions for downloading. The use of ISDN video conferencing and FirstClass electronic conferencing into the studio floor aimed to provide two means of communication, in addition to telephone and fax services, to enhance interaction during the programmes. In particular, the use of ISDN video conferencing during the programmes was seen as a means to bring guests and viewers "into the studio" from a distance to contribute to the programmes.

The various aspects of the operational model for WIRE-Mediaspace are illustrated in Figure 2, including the balance between synchronous and asynchronous working and the role of each technology in delivery of learning materials, providing communication and access to information.

The content of Mediaspace (i.e. distance learning in multimedia) was chosen to explore the rich audio-visual nature of the topic and the practical issues of bandwidth requirements to transfer very large multimedia files in the context of using combined technologies. There are benefits in using the relatively high bandwidth offered by ISDN services for file sharing and the audio-visual quality provided by satellite TV transmissions.

The RATIO Project

RATIO (Rural Area Training and Information Opportunities), was a European-funded project (Wheeler, 1997) aimed at establishing 40 regional telematics centres throughout the Objective 5b area of the South West of England (Figure 1). RATIO aimed to regenerate the economic fortunes of the region and had a particular focus on re-skilling existing SME work forces. RATIO's telematics learning centres are equipped with digital satellite receivers, desktop ISDN video conferencing, computer-mediated communication and Internet connectivity. In terms of technology infrastructure, these RATIO centres distributed in the community are analogous to Euro Study Centres, based in the universities that received the WIRE-Mediaspace course. The difference between the two was that RATIO centres used digital satellite receivers.

A variety of courses are available through RATIO, covering a range of topics in vocational training and professional updating, including business, management, computing and languages. RATIO courses offer differing approaches to the WIRE-Mediaspace operational model, using different combinations of technologies to deliver specific courses. RATIO has placed more emphasis on using telematics technologies in the area of communication for learning support, assessment and evaluation. Live TV transmissions feature widely in course delivery. In contrast with WIRE-Mediaspace, where few paper materials were used some RATIO courses have put more emphasis on using paper-based learning materials and CAL software located in the centres.

ADAPT through RATIO is a current project funded through the European Social Fund ADAPT Programme and has been set up to develop courses and content for education and training programmes to be delivered at a distance. The RATIO centre infrastructure can be used to deliver these courses.

Institute of Health Studies Research Seminars

In the recent reorganisation of education for health care professionals in the UK, the University of

Plymouth was awarded the contract for the health care students in the South West region and the Institute of Health Studies was set up. Degree courses and postgraduate awards for nurses, midwives and other health care professionals are delivered to four main sites, i.e.Pool, Plymouth, Exeter and Taunton and to study centres in eight hospitals in the region (Figure 1). The four main sites are connected to the SWAN network but the hospital study centres are not due to restrictions in connectivity. All twelve centres can receive digital TV broadcasts and this technology is used to provide a series of research seminars for nursing students. Interaction and feedback in the live sessions is enabled using telephone dial-in.

With the current development of high quality video conferencing over the SWAN network, feeds to studio can be taken from any of these four main sites for integration into the live transmission. This enables guest lectures from these sites to contribute without travelling. In addition ISDN2 or ISDN6 feeds can enable guest lecturers from other organisations to participate from a distance. The integrated set-up is shown in Figure 3.

Interest has been shown outside the region and students at the University of Hull, at a distance of over 500 km from Plymouth, are now participating in these research seminars.

Euronet

Euronet is another current ADAPT Programme project, in which the University of Plymouth is a partner. The partners in Euronet are distributed throughout the UK, in Wales, North East England and East Anglia. One aspect of Euronet is to explore the potential for inter-regional distance training using a variety of technologies. In a live programme in July 1999, an ISDN2 feed was taken from the University of Hull via a video conferencing bridge and transmitted from the Plymouth studio. The use of ISDN2 limited the quality of the video that was broadcast but the interaction in the progrramme was good.

A more ambitious session was broadcast to Euronet partners, RATIO centres and other venues (Figure 5) in October 1990. The programme, sponsored by the Department of Trade and Industry, formed part of the dissemination process for the UK Information Society Initiative. Live ISDN6 video conferencing feeds were taken from Pendle, London, Cardiff and Birmingham, where guest speakers were located, with audiences from businesses. Guests in the TV studio could interact with participants at these four main sites via video conferencing. In addition, viewers from other sites could ask questions via telephone and e-mail. The quality of the ISDN6 feed was much more satisfactory than the ISDN2 feed in the earlier broadcast.

TETRASUR - TElematics TRAining for SURgeons

Training surgeons in rural hospitals can be problematic, due to the costs and travel time involved (Dawson, 1998, Bunch et al., 1998). When surgical trainees spend time away from the surgical area to attend lectures and seminars other practitioners must fill the gap. Distance learning delivery using telematics was seen to provide a possible answer to these problems. The South & West Region of England covers a large geographical area with 3.5 hours travelling time between its remotest hospitals. There are over 300 basic surgical trainees studying in the 14 teaching hospitals. There is therefore a very strong case on practical and economical grounds to explore the potential for providing surgical education in the region using distance learning technologies, enabling surgical trainees to remain within their work environment whilst continuing their studies.

The TETRASUR initiative was set up to evaluate the use of distance learning technologies for delivery of the MRCS course to trainees working in hospitals. The TETRASUR course includes lectures, case presentations and interactive discussions by ISDN2 video-conference and satellite TV links. The course is supported by 140 tutors and teachers from the South & West Region in England with over 300 surgical trainees participating in 6 of the 14 teaching and district general hospitals in 3 counties in South West England. Since September 1997, 42 modules have been successfully delivered from Plymouth. At the beginning of the 1999 academic year, satellite and video conferencing links were being established outside the region in Dartford, Kent and at the Royal College of Surgeons, London, with further links planned elsewhere in the UK.

Efforts have been made to decentralise the delivery of the TETRASUR lectures by bringing in more contributions from external sites. Bearing in mind the limitations of ISDN2 for video quality, this development has prompted the exploration of alternatives to ISDN2 for this type of remote feed. For example, trials are planned in the 1999 to evaluate the use of ISDN6 and other high bandwidth terrestrial networks (Figure 6) to establish what network solution provides acceptable quality of video and sound for external content feeds. This will be surveyed from the perception of trainees, Surgical Tutors and lecturers to establish what is acceptable. These trials will explore the potential to use managed bandwidth over the SuperJANET educational network, within the security limitations of connectivity restrictions between educational and NHS networks.

Discussion and further work

As a result of experiences in WIRE-Mediaspace and RATIO an attempt was made to visualise the various parameters that contribute to the successful delivery of distance learning courses (Vranch and Wheeler, 1997). It is important to select appropriate technologies that are affordable, accessible and match the end-users' perception and expectation of quality of content.

The Benefits Analysis Map is an attempt to quantify three parameters: High Quality, Wide Access and Low Cost for delivery of distance learning via a single technology or via a combination of technologies and networks. This is intended as an aid in deciding which technologies are appropriate in delivery of a particular distance learning course. The approach is at first student-centred in that the three parameters are considered from the student perception of the distance learning experience. However the approach can also be applied equally to consideration of the three parameters from the viewpoint of the course provider.

The example in Figure 7 shows the three parameters arranged in a triangle with a specified target minimum requirement zone (dotted line) and an example solution (unbroken line) plotted. Distances are measured from the centre, O, such that the distance OQ represents the extent to which the parameter High Quality has been met. The longer the distance OQ, the closer the solution meets the condition of 100% High Quality. Similarly, the distances OA and OC represent the extent to which 100% Wide Access and 100% Low Cost are being achieved. The example plot must fall outside the target minimum requirement zone to meet all three parameters. In Figure 7, the example achieves the required level of Wide Access and Low Cost but fails to meet the requirement of High Quality. In practice, this simple example could represent the delivery of multimedia course content in 10 minutes via a 28.8 Kbps modem to a user in the UK. Equipment costs (user and provider) and line charges are relatively low, access to a telephone line is wide but the modem bandwidth is not adequate to deliver the large files within the time period required.

The projects described above have provided valuable experience in the integration of computer technologies and networks to deliver distance learning courses. The WIRE-Mediaspace live satellite TV transmissions enabled the quality of video and audio content appropriate to a course in multimedia to be received at a distance. The content of the transmissions formed a large part of the learning materials in the course. Interaction, via telephone, ISDN video conferencing or computer mediated conferencing/electronic mail, took place at one time or another to bring in expert guests and for student questions. As the series progressed it was interesting to note that students moved away from video conferencing as a means to ask questions and more towards electronic mail. As Dooley points out, frequency of e-mail use increases in direct relation to cognitive demands of the work (Dooley, 1996). E-mail was seen as a means to maximise interaction while minimising interruption, since the electronic mail interaction could take place unobtrusively during the live programme. On the other hand, integration of guest speakers was best achieved via ISDN2 video conferencing, although the quality of video and sound were noticeably inferior compared with satellite television quality.

These considerations demonstrate the range of network infrastructure options that can enable interaction. They also illustrate the advantages of using a combination of technologies via terrestrial and satellite networks to enable users to interact using appropriate modes. Although Euro Study Centres are equipped with standard facilities (for satellite reception, ISDN video conferencing and Internet access) the option to interact from a range of technologies is important to deliver distance learning into regions that have varying levels of network infrastructure available. The nature of the WIRE project, with its focus on ISDN, precluded the use of the data carrier to deliver learning materials at 128 Kbps (i.e. up to 50 Mbytes of data during a one hour programme). Clearly, this facility can be an advantage for regions with inadequate terrestrial networks or where data transfer with high security is required.

One issue that emerged from WIRE-Mediaspace was that of bandwidth available for both send and return functions. The broadcast nature of the TV programmes was ideal for sending high quality video that comprised a major part of the course materials. Similarly, ISDN2 and low bandwidth terrestrial networks for electronic mail communication were adequate for effective return feedback and questions, although the limitations of ISDN2 were noticed when guest experts were delivering content via video conferencing. The problem of limited two-way bandwidth was highlighted when students needed to collaborate on joint multimedia projects. High bandwidth communications in both directions are essential in this case to facilitate transfer of large multimedia files in a collaborative project.

RATIO has illustrated the importance of good communications and interaction between staff working at remote centres on administration, training and technical support levels. In particular, video conferencing (for meetings) and TV broadcasts (for staff training, marketing) have been important in this respect. With the scale of numbers (40) and dispersion of the RATIO centres it is important to develop a community spirit among staff in the team. RATIO centres are all equipped with MPEG2 digital satellite receivers. This offers the advantage of operation at lower transponder costs compared with broadband analogue (FM) transmission. Digital satellite receive equipment is not widely installed at present, making the potential audience outside of RATIO small, however this may be an advantage in terms of exclusivity of course content on a course fee charging basis.

The importance of practical, organisational issues has been demonstrated in the implementation of the TETRASUR initiative. Synchronisation of release of trainees so that they are available on the same day of the week for the interactive sessions was not an easy task at first, bearing in mind that these trainees were based in several hospitals across the region,. However, the nature of the interactive delivery directly into the workplace made this easier to achieve. Since the trainees were still on site while attending the TETRASUR sessions, permission for release was more readily obtained from management. Savings in travel time could also be more efficiently used as additional study time. The fact that the Institute of Health Studies telematics centres set up by the University in hospitals for distance education for nurses have been made available to doctors on the MRCS course demonstrates a clear commitment to multi-professional working. Indeed, the technology itself has been a key factor in encouraging a multi-disciplinary working culture. Clearly, the delivery infrastructure and approach adopted for TETRASUR can be used to deliver other courses to hospitals.

Evaluation of the TETRASUR project has consisted of post-course interviews with trainees to obtain levels of satisfaction. Generally, feedback from the trainee groups has proved very positive. The fact that the live, interactive TV sessions were an "event" was seen as an advantage by the trainees and was seen as a welcome opportunity to study within the constraints of their demanding work schedule. Trainees valued the opportunity to interact with national and international experts in the field of study who presented the lectures from the Plymouth studio. The TETRASUR approach also encouraged interaction within the trainee groups, both between hospitals and within hospitals. Again, the live "event" helped to bring individuals together as a group. By their own admission, trainees identified that their Information and Communication Technology skills were not advanced and the use of live TV with video conferencing enabled them to benefit from the live sessions, despite their limited ICT experience.

Several areas of concern were raised. Firstly, trainees commented that although they were supportive of the delivery technology, there were a few shortcomings. In particular, technical issues were identified with ISDN2 videoconferencing, relating to inferior visual quality and time lag. Trainees also suggested that presenters should intersperse their talks with question and answer sections to enhance the interactive nature of the lectures. Finally, trainees indicated that introductory lecture material need not be delivered, as the STEP course manuals provided this input. All of the above comments have been taken into consideration in the planning for the 1999 academic year.

The use of ISDN6 external video conferencing feeds has demonstrated the importance of the quality aspect in the cost benefits analysis for business and medical training applications. Access to Health Service networks may pose a problem for the use of SuperJANET to provide feeds at bandwidths greater than 384 Kbps. Nevertheless trials are expected to go ahead with a 2 Mbps link over SuperJANET to enable a comparison with the ISDN6 trials. It is hoped to connect the three main hospitals in the region to the SWAN network, therefore providing very high bandwidth feeds to the TV studio for the TETRASUR transmissions.

The ISDN6 / SuperJANET connectivity to the Plymouth TV studio and TDS4b uplink has potential to provide a national resource for education and this is being explored. Transponder charges and digital decoder costs (Figure 8) have changed considerably over the last eight years and this has affected the balance in terms of the cost benefits analysis. At current prices, all three parameters, i.e. quality, access and cost, are favourable.

In a wider context new networking and ICT technologies are being introduced that must be considered for inclusion in an integrated approach. For example the potential introduction of ADSL (Asynchronous Digital Subscriber Loop) technology in the UK offers some attractions to distance learning delivery. ADSL provides an asymmetric bandwidth of, for example, 4 Mbps with a return bandwidth of 64 Kbps on existing twisted-pair copper telephone lines (Negroponte, 1995). Again, applying the Benefits Analysis Map to ADSL in the UK identifies the advantage of wide availability of telephone network infrastructure and good quality video reception at the user end. As with WIRE-Mediaspace use of the return line may be acceptable for student interaction with a live lecture via e-mail but may not be of high enough quality to enable a lecturer to deliver from a distance. Again, there is the issue of centralised broadcast with an appropriate level of decentralised interaction and contribution.

Costs of ADSL connection in the UK are presently expected to be at least as much as ISDN2. More importantly, the costs and access to ADSL technology to potential providers may be prohibitive. Whereas it is straightforward for individuals and institutions to set up World Wide Web servers, use educational networks and even access satellite uplink facilities, there may be limitations in delivery of courses via ADSL. ADSL is not an attractive technology in countries that do not have an extensive telephone network infrastructure.

As new technologies develop, the opportunities to combine them for multi-mode delivery open up, thus widening the potential number of users that can receive courses. For example, the combination of satellite and cable networks was implemented in WIRE-Mediaspace to extend the reach of the programmes to homes in Finland. Combined satellite and ADSL networks would widen access to users in countries with widely differing network infrastructures.

The potential contribution of VSAT (Very Small Aperture Terminal) technology is worthy of consideration. VSATs such as the TDS4b uplink at the University of Plymouth are satellite transmit systems. As costs of VSATs fall so their potential contribution in an integrated satellite/terrestrial network becomes more important. In particular VSATs can provide very high bandwidth, two-way communication - the very requirement that is the stumbling block for several applications discussed above. Again, the potential advantages of multi-mode delivery systems if they include VSAT technology for a high bandwidth return facility will be substantial.

Technologies for distance learning are developing fast, especially in delivery systems and learning support network infrastructures. In order to achieve the required levels of Quality, Access and Cost that users and providers expect, it is likely that solutions for delivery of distance learning courses will involve an appropriate combination of computer and network technologies. In particular it seems likely that a combination of satellite and terrestrial networks will be a key factor in the delivery of effective distance learning courses.

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Acknowledgements

The support for the work described in this paper from the following organisations is gratefully acknowledged:

- Autosuture

- Ethicon
- South West Deanery, Bristol
- Royal College of Surgeons of England.
- European Space Agency
- European Social Fund Adapt Programme
- TEN Telecom
- Department of Trade and Industry, H.M Government
- Department for Education and Employment, H.M Government,
- Joint Information Systems Committee
- Higher Education Funding Council for England

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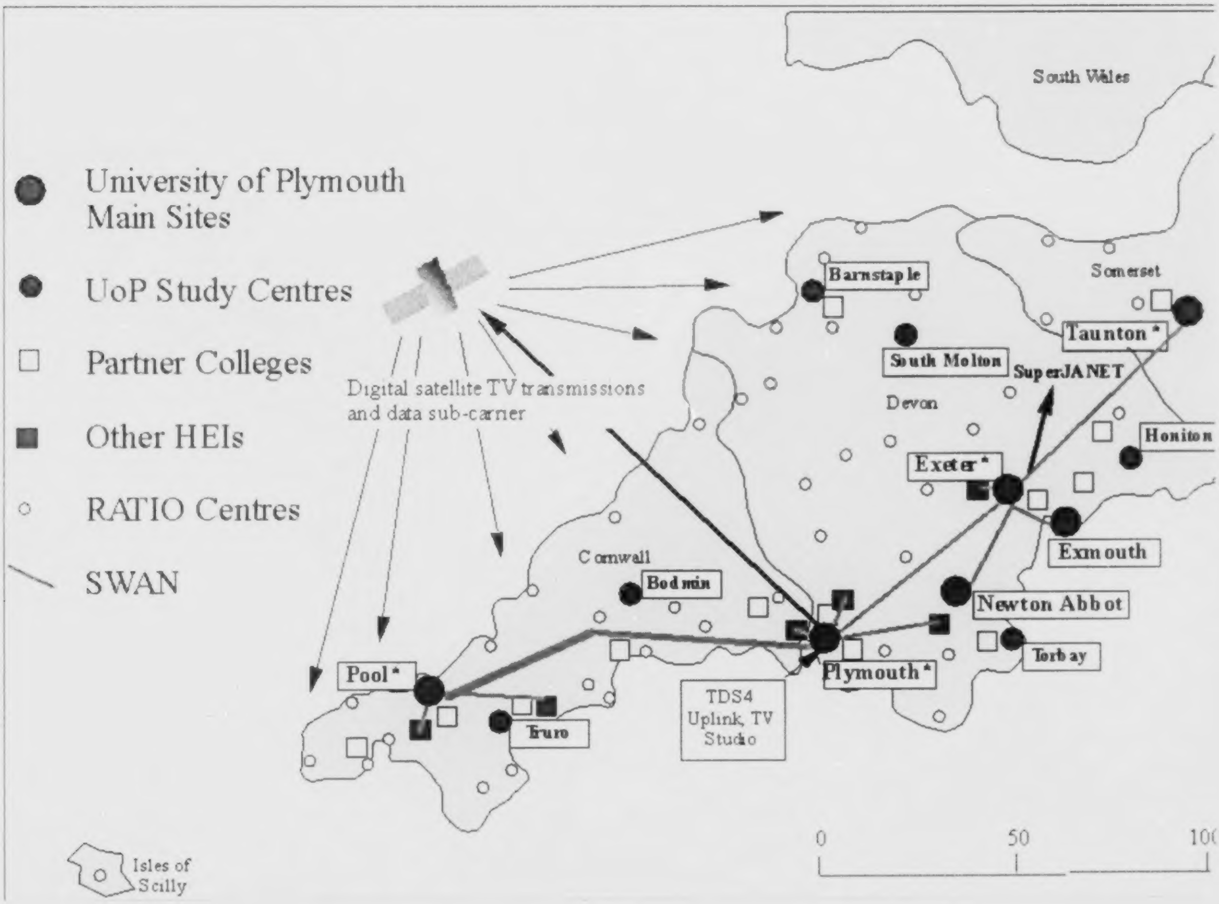
University of Plymouth Main Sites
UoP Study Centres
Partner Colleges
Other HEIs
RATIO Centres
SWAN
South Wales
Somerset
Barnstaple
South Molton
Taunton *
SuperJANET
Devon
Honiton
Exeter *
Exmouth
Newton Abbot
Torbay
Cornwall
Bodmin
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Figure 1. University of Plymouth satellite and terrestrial networking infrastructure

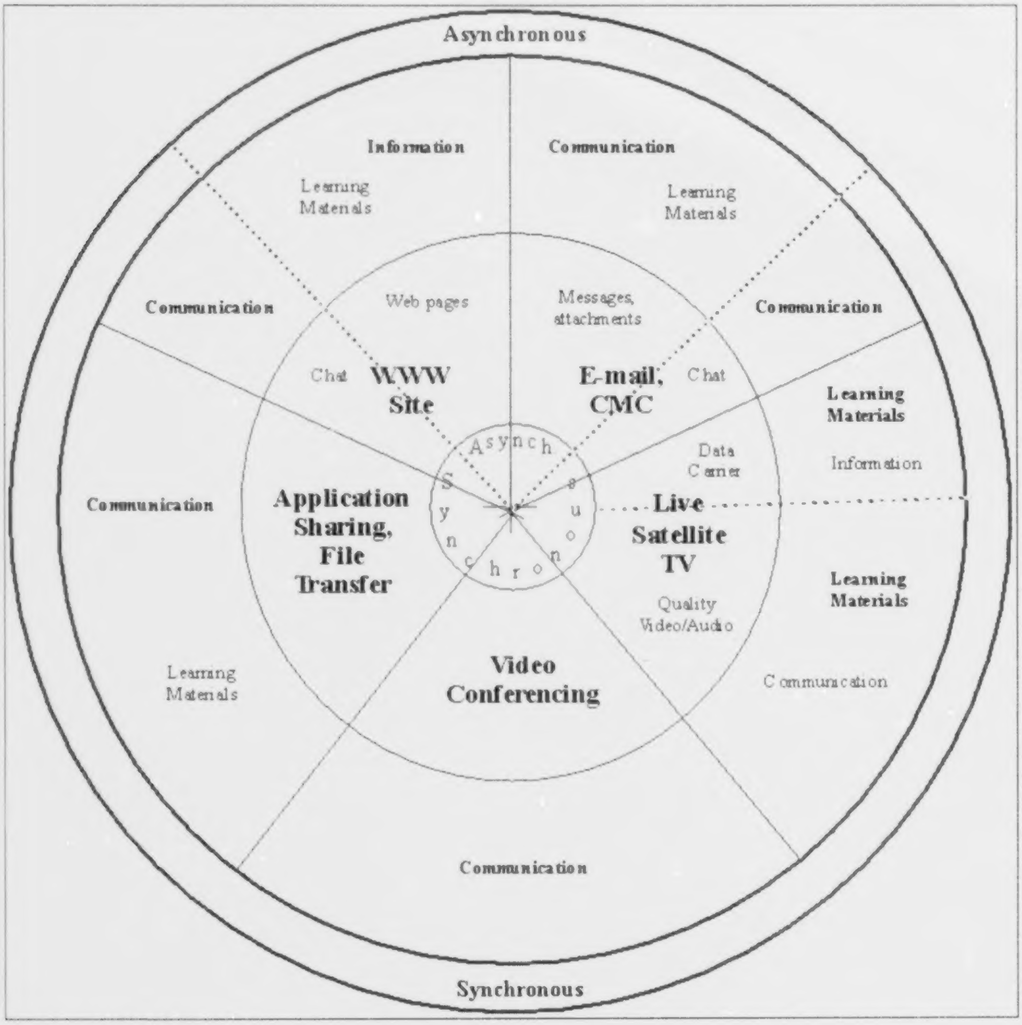
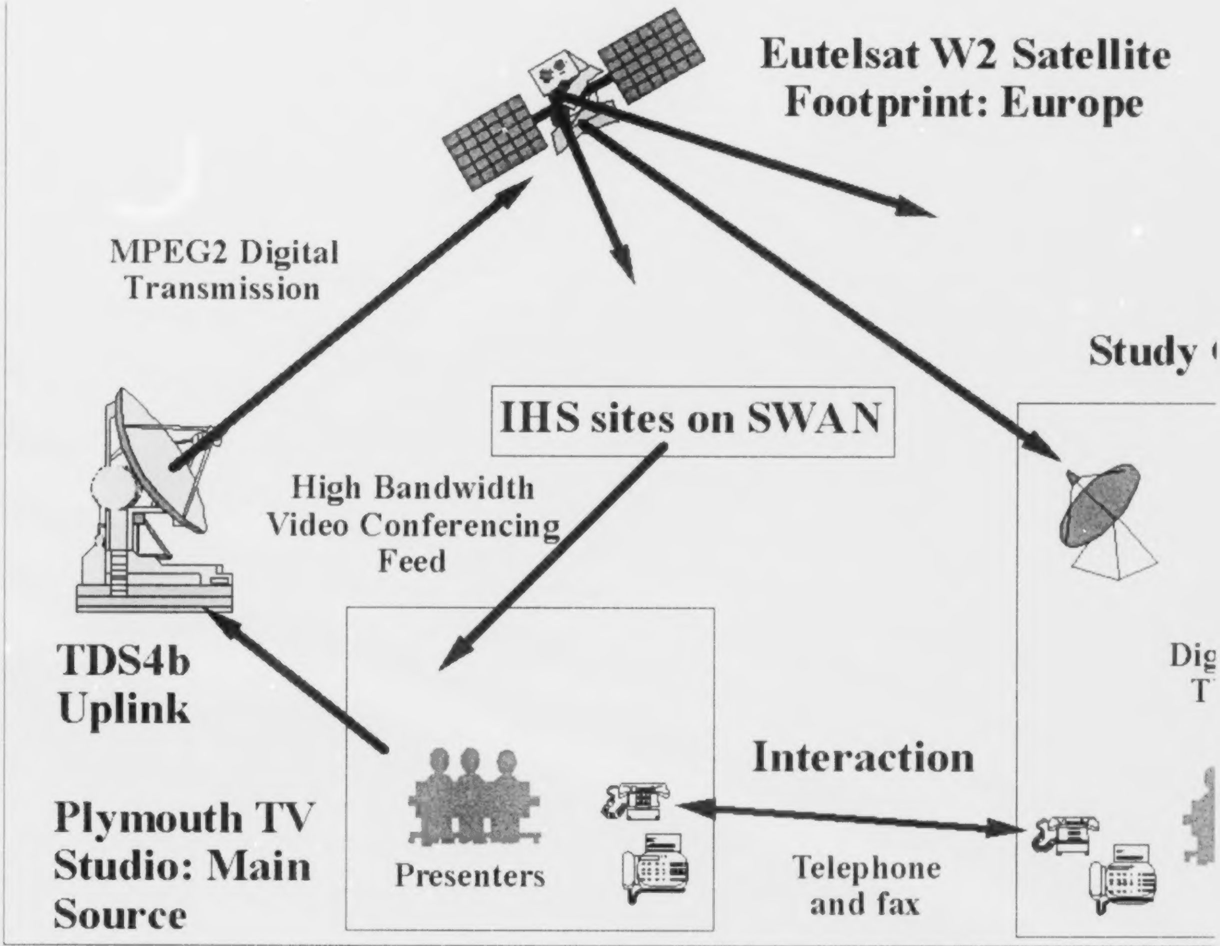

Asynchronous
Information
Learning Materials
Communication
Learning Materials
Communication
Web pages
Messages, attachments
Communication
Chat
WWW Site
E-mail, CMC
Chat
Learning Materials
Information
Asynchronous
Data Carrier
Communication
Application Sharing, File Transfer
Live Satellite TV
Synchronous
Quality Video/Audio
Learning Materials
Learning Materials
Video Conferencing
Communication
Communication
Synchronous

Figure 2. WIRE - Mediaspace: integrated technologies for distance learning


Eutelsat W2 Satellite
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Studio: Main
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Presenters
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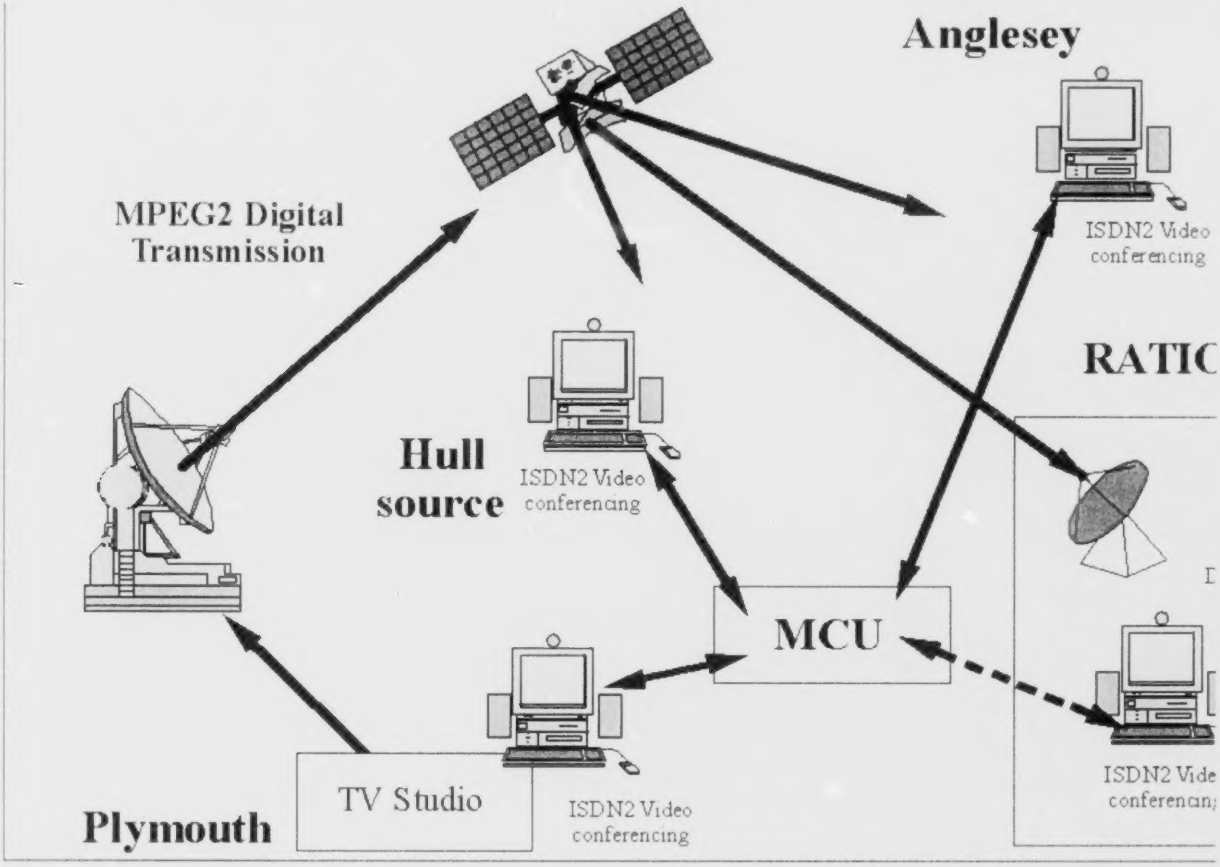
and fax

Figure 3. Schematic for telematics delivery: IHS research seminars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ISDN2 Video conferencing
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Figure 4. Schematic for telematics delivery: Euronet Transmission, July 1999

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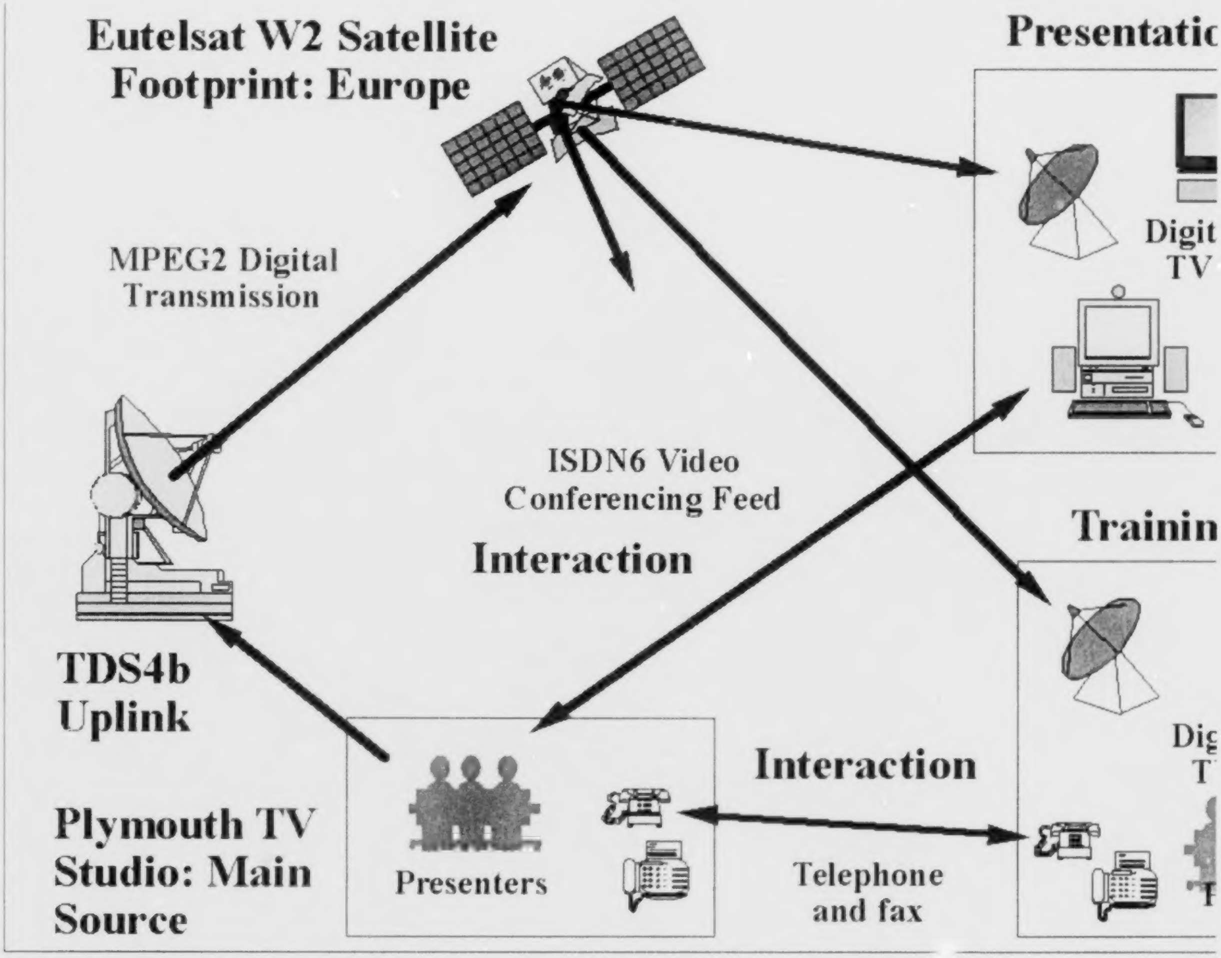
Eutelsat W2 Satellite
Footprint: Europe
Presentatic
MPEG2 Digital
Transmission
Digit
TV
ISDN6 Video
Conferencing Feed
Interaction
Trainin
TDS4b
Uplink
Interaction
Dig
T
Plymouth TV
Studio: Main
Source
Presenters
Telephone
and fax

Figure 5. Schematic for telematics delivery: Euronet/DTI Transmission, October 1999

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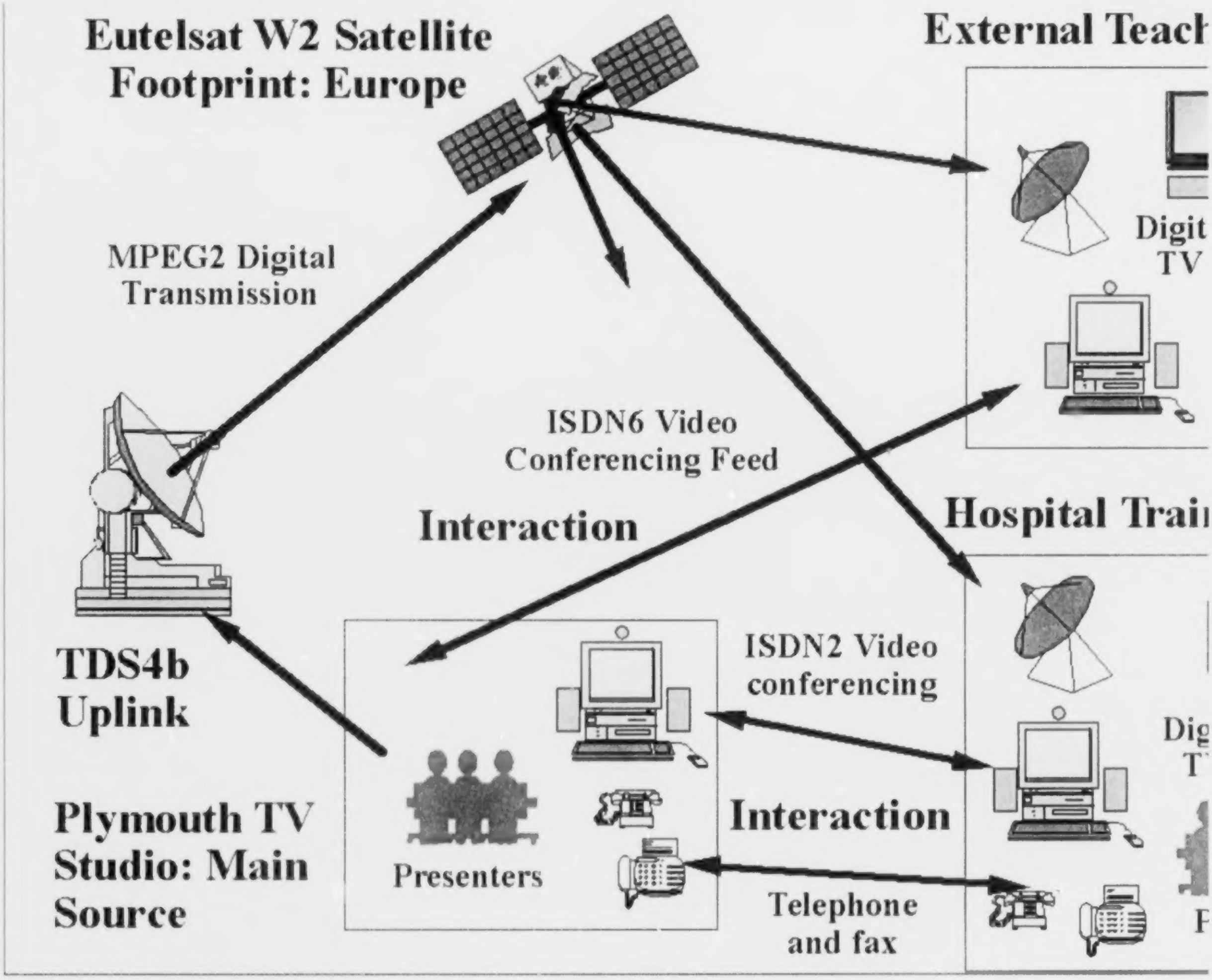
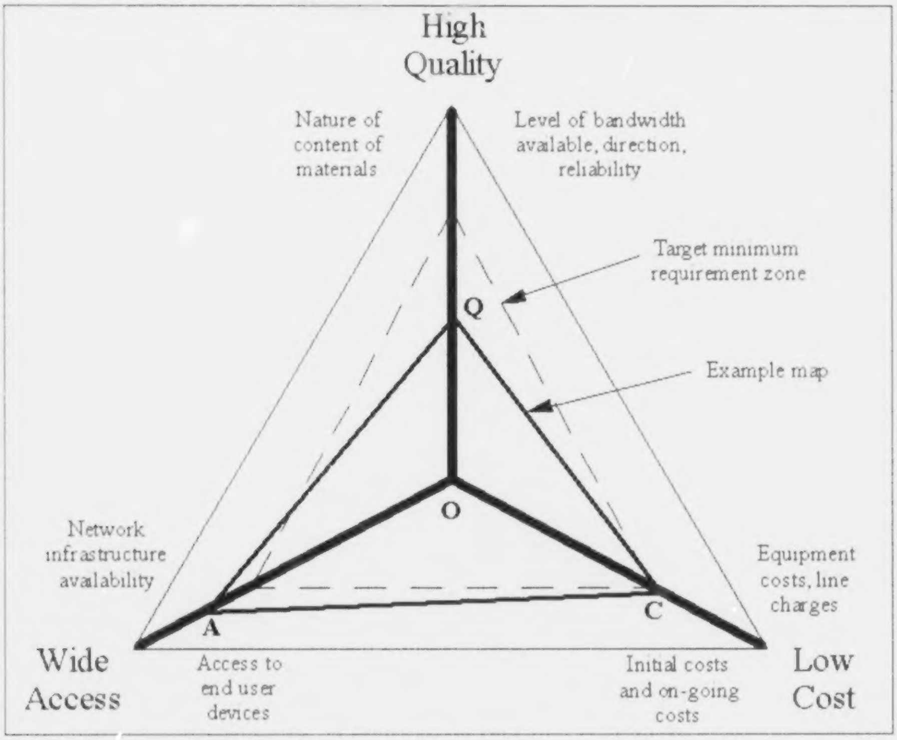

Eutelsat W2 Satellite
Footprint: Europe
External Teac
MPEG2 Digital Transmission
Digit TV
ISDN6 Video Conferencing Feed
Interaction
Hospital Trai
TDS4b Uplink
ISDN2 Video conferencing
Dig T
Plymouth TV Studio: Main Source
Presenters
Interaction
Telephone and fax

Figure 6. Schematic for telematics delivery: TETRASUR high bandwidth feed


High Quality
Nature of content of materials
Level of bandwidth available, direction, reliability
Target minimum requirement zone
Q
Example map
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Network infrastructure availability
Equipment costs, line charges
A
C
Wide Access
Access to end user devices
Initial costs and on-going costs
Low Cost

Figure 7. Cost benefits analysis map

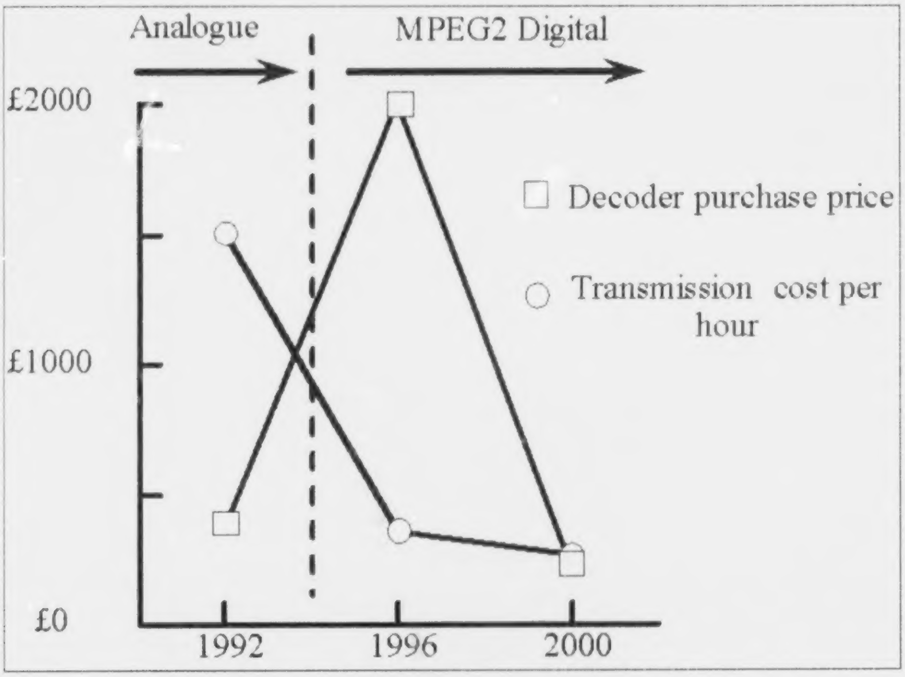
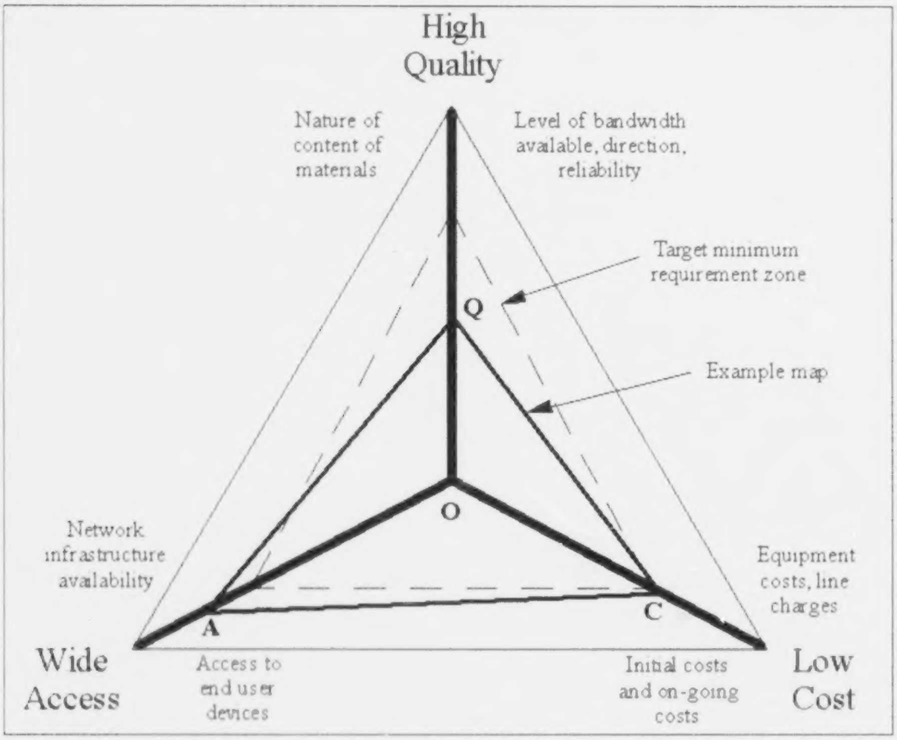
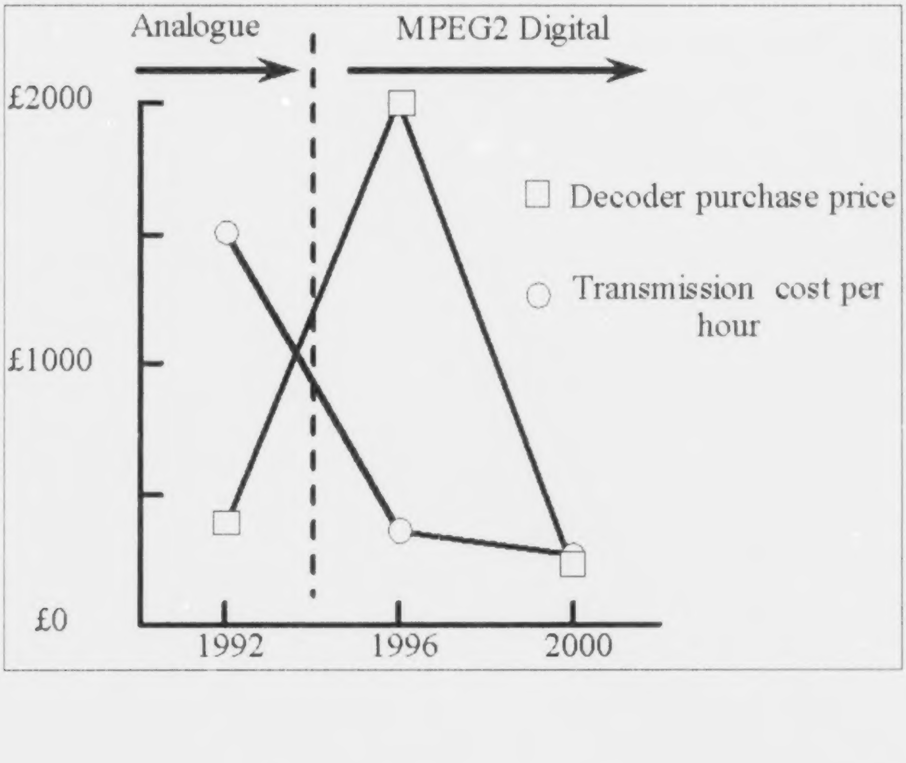


Figure 8. Changes in satellite transponder charges and decoder costs


High Quality
Nature of content of materials
Level of bandwidth available, direction, reliability
Target minimum requirement zone
Q
Example map
O
Network infrastructure availability
Equipment costs, line charges
A
C
Wide Access
Access to end user devices
Initial costs and on-going costs
Low Cost


Analogue
MPEG2 Digital
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ID Number: EDU9935

Title: Intellectual Property and Copyright: Protecting Educational Interests and Managing Changing Environments

Author: Janis H. Bruwelheide

Organization: Montana State University-Bozeman

Year: 1999

Abstract: This paper will present a brief overview of several topics. The first is ideas and concerns as to why faculty and institutions in education, particularly higher education, have good reasons to ask questions concerning "who owns what" in an era where educational opportunities may be delivered through the Web and various distributed learning systems. Secondly, it will present issues relevant to learner support and student ownership. Thirdly, it will present ideas about ownership which institutions might consider. Lastly it will present an overview of salient copyright changes and issues for 1998 and 1999 and sources of additional information.

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Intellectual Property and Copyright: Protecting Educational Interests and Managing Changing Environments

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Abstract

This paper will present a brief overview of several topics. The first is ideas and concerns as to why faculty and institutions in education, particularly higher education, have good reasons to ask questions concerning "who owns what" in an era where educational opportunities may be delivered through the Web and various distributed learning systems. Secondly it will present issues relevant to learner support and student ownership. Thirdly it will present ideas about ownership which institutions might consider. Lastly it will present an overview of salient copyright changes and issues for 1998 and 1999 and sources of additional information.

Overview

The electronic environment is currently forcing educators at all levels to revisit issues concerning intellectual property. Quick availability of information and data through the Internet has changed the way the general public views information since it is in seemingless endless supply through use of computers on anyone's desktop. Thus, faculty and students alike are faced with an endless, figurative smorgasbord of materials in varied formats. A dilemma concerning intellectual property occurs when owners' rights collide with users' rights and the public need to access and use resources. Thought provoking papers about the Internet and intellectual property are becoming available on the World Wide Web. Esther Dyson has written a book, *Release 2.0*, and several articles dealing with intellectual property on the Internet and the intellectual value of property. An article by Vincent J. Roccia presents an interesting perspective on copyright law in the United States and possible changes or clarifications needed perhaps to enhance applicability to the Internet. Current copyright laws in the United States perhaps do not quite address the Internet per se because it represents a challenge to existing law and interpretations. Burk presents a discussion of intellectual property issues and challenges presented by the "Electronic Frontier."

This paper will present a brief overview of several topics. The first is ideas and concerns as to why faculty and institutions in education, particularly higher education, have good reasons to ask questions concerning "who owns what" in a era where educational opportunities may be delivered through the World Wide Web and various distributed learning systems. Secondly it will present issues relevant to learner support and student ownership. Third, the paper will provide a brief overview of copyright legislation changes and reports which occurred in 1998 and 1999. Lastly it will present some sources of information, sample policies, and ideas about ownership of intellectual property which institutions might consider. Readers may wish to explore the listing of recommended resources for additional information.

Intellectual Property

Faculty and Institutional Concerns

Distribution mechanisms, format of materials, and traditional models of ownership are bringing increasing concerns about intellectual property development, use, and application to a new importance in academic conversations. University professors, under the old way of viewing ownership, were the single owners and authors of intellectual property with a few exceptions. However, in today's environment, ownership may be shared with several individuals or organizations as new technology encourages development of multimedia products using a variety of formats and pieces which may involve multiple layers of copyrighted materials.

The dilemma of "who owns what" is compounded when one considers matters such as how much support, use of facilities, and equipment involvement are used to produce a work using newer electronic technologies. Often the institution has invested a great deal of funds in a project or product before it is used for educational purposes. The author believes that basically four major issues concerning intellectual property need to be addressed by faculty and institutions through dialogues, policies, and communication:

1. Ownership of intellectual property
2. Rights to use intellectual property
3. Procedural issues concerning intellectual property
4. Special considerations concerning copyright

In most cases, an "audit" or checklist of what rights need to be acquired, cleared, or considered must be developed prior to design, production, and delivery of a course, for example, through the World Wide Web or through other distance learning distribution systems. Institutional personnel should think through what rights are needed for a course and what all future possible uses and distribution mechanisms of course content might be prior to release. If not accomplished prior to development, the entity could find itself having to retrace steps and renegotiate or acquire additional rights at more cost. Thus, planning ahead with a checklist approach could save a great deal of money, effort, and hassle for all involved.

Some authors and organizations have made information available which can encourage and guide discussions about intellectual property in the higher education environment. Many professional associations are discussing the issues but no definitive checklist or statement exists currently since ultimately each institution must deal with the volatile topic of intellectual property and issues concerning "who owns what" at the state or local level. A few examples of resource materials are included at the end of this paper. An interesting document entitled *Ownership of New Works at the University: Unbundling of Rights and the Pursuit of Higher Learning* by the Consortium for Educational Technology for University Systems, CETUS (www.cetus.org), suggests several points worth considering in a discussion. The group sets forth a viewpoint that simple, individual ownership of all rights which are associated with copyright may not now be the most desirable avenue as it may stifle creativity and new work unduly. Thus, it is time for higher education to revisit ownership of intellectual property in order to avoid contention, place the focus on optimal access and development of works, and reduce the emphasis on economics which often dominates discussions about intellectual property. CETUS sets forth the "three C approach," to conversations about intellectual property: creative initiative, control of content, and compensation concerning published as well as unpublished works. The approach is quite useful as it may be less intimidating and antagonistic than beginning with the economic issues and may apply more broadly to faculty engaged in producing materials but not necessarily receiving compensation for those materials.

The CETUS model for discussion, the "three C approach" presents the following points. The first point is creative initiative and poses discussion questions such as "who generated the idea for the work, whether published or unpublished, and who created the work and fixed it in a tangible medium? For example, a Department Chairperson might encourage faculty to publish but not dictate the ideas and content. The entities of initiator, creator, and fixator may not be the same. The second point for discussion deals with the control of content as to who controls creation, production, specifications, and authority for acceptance. The degree of control is something which might be negotiated. The third point is compensation and other support. The CETUS document suggests that unless the two were extraordinary--above what faculty are normally provided-- the faculty would most likely retain ownership of intellectual property they created. Again, there are many areas of negotiation under the third discussion point.

Another way of approaching ownership of intellectual property is presented in a paper by Dan L. Burk, an attorney and Associate Professor of Law at Seton Hall University. He presents a good overview of models for copyright ownership of electronic course materials between faculty and their sponsoring institutions. His paper presents detailed discussion of advantages and disadvantages of three sets of options and two models which might be considered by universities and colleges drafting documents for copyright. Option summaries are as follows:

Option set one assumes that faculty members are to be considered authors of their work produced while employed at a University:

> Option 1.1: Faculty member authors a work but assigns ownership to the University
>
> Option 1.2: Faculty member authors a work with a non-exclusive license to the University

Option set two assumes a work-for-hire interpretation when faculty are employed by a University where authorship does not reside with the faculty member:

> Option 2.1: University as the author with a non-exclusive license to the faculty member
>
> Option 2.2: University as the author but assigns rights to the faculty member

Option set three applies if faculty creators are treated as independent contractors on a project:

> Option 3.1: University as author but assigns rights or license to the faculty member
>
> Option 3.2: Faculty as author who then assigns rights or license to the University

In summary for this section, it is important for universities, colleges, and faculty to engage in dialogue concerning intellectual property so that ownership issues are clearly defined before products are developed by institutions, faculty, and even students. There is plenty of room for negotiation but faculty must be informed about policies and participate in the development. If not, both faculty and institutions stand to lose a great deal. Creation of new intellectual property is very important and the climate must be supportive for both sides.

Student and Learner Support Issues and Concerns

Students' rights to ownership of intellectual property they develop while students or student workers at a college or university need to be considered in addition to rights of faculty. In some instances, universities and colleges lay claim to all work produced by students. This issue needs to be addressed by institutions, policies developed, and ways found to inform students as in the catalogs for the institutions.

Learner support issues for courses delivered via distributed learning technologies bring new concerns to the discussion table. Included are topics such as electronic reserves for libraries and housing of course syllabi and materials on a university computer network. The author presents questions such as the following:

1. What rights need to be acquired and cleared prior to posting course materials including syllabi and readings on a closed versus an open network? The same question applies to courses delivered via the World Wide Web and other distributed learning networks such as video conferencing.

2. Is an online class treated the same or differently than a traditional "face-to-face" class when it comes to copyright issues? Many institutions are treating an online class such as one delivered via the Web or through computer conferencing software as a closed class which must be password protected. Thus, only students actually enrolled in the class could access materials with a password and not much material could be seen by non enrolled individuals.

3. What about posting student work to a class web site? It would seem certainly that clearances

would have to be obtained from the students.

4. May students freely use materials they find via the World Wide Web for class projects? Does the format make a difference or are formats such as music, video, and graphics to be treated differently than print materials?

5. May library personnel scan articles for online class reserve systems? If so, must the network be closed except through students enrolled in a specific class?

Legal Highlights

Digital Millenium Copyright Act

Online Service Provider (OSP)

The Digital Millenium Copyright Act is now P.L. 105-304. This is a complex law which is multifaceted and contains several aspects with differing dates for compliance. An important provision is a limitation on potential financial damages that Online Service Providers (OSP's) can face in cases where they function as common carriers and allow online users access to copyrighted materials placed on the site by someone else. If OSP's comply with the new rules which became effective in October, 1998, they may escape liability and potentially large financial penalities. Readers should consult sources listed at the end of the paper for additional information. Lide presented a good summary and materials on the Web by attorneys Crews and Lutzker are very readable. The Copyright Crash Course at the University of Texas has excellent content and model policy procedures. It also contains a beta test of an online "copyright tutorial" for network users. Highlights of the law for online service providers which can include educational institutions and libraries are as follows. Institutions must implement these four points immediately to qualify for the limitation. The Library of Congress has posted information at its website.

1. An agent to receive statutory notices from copyright owners must be designated who will also send notices to affected subscribers.

2. The name and contact information for the agent must be given to the Copyright Office and posted on the OSP's website.

3. A policy for termination of repeat offenders and a method to inform network users of copyright laws and institutional policy must be developed.

4. The OSP must comply with "take down" and "put back notice requirements.

Another interesting piece of this law is a special clause regarding research and teaching employees at public and nonprofit higher educational institutions. There is a special exception to the rule that an institution is usually responsible for acts of its employees. Faculty and graduate students under employment to teach and do research will not be considered to be "the institution" for purposes of OSP according to the DMCA. With three exceptions, this clause is an "escape" for an institution when a faculty or graduate student posts infringing materials. If this clause did not exist, the institution would automatically forfeit its right to the OSP limitation.

Reproduction by Libraries and Archives (Section 108 B and C section changes)

Another part of the Digital Millenium Copyright Act was a much needed provision to update section 108 of the current Copyright Law, P.L. 105-304 Stat. 2860. For years, libraries and archives have dealt with the problem of preserving and distributing deteriorating works still under copyright protection. Current copyright law usually prohibited preservation in digital format as the works had to be preserved in "facsimile format" which was often problematic. The new provision allows libraries and archives, with certain conditions, to make up to three copies of some works for preservation and security reasons, use newer technologies for such copying and provides additional protections if a "format" becomes obsolete. A copyright notice is required to be affixed to copies if it was on the original item. In the case of unpublished works, digital copies must remain on the premises. There are several rules which apply to these privileges and readers should consult the Crews document at the Copyright Management Center for a complete breakdown of section 108 changes.

Distance Education

In May, 1999, the U.S. Copyright Office published a report on distance education and copyright which had been mandated by the Digital Millenium Copyright Act. In October, 1998, the DMCA ordered the Copyright Office to conduct a series of hearings nationally, compile testimony, examine the issues, and make recommendations based on its study which were needed, if at all, in existing Copyright Law for distance education. The Office was given six months to do this massive job which included "response time" from interested parties. The hearings process ran smoothly and organizations and representatives for copyright owners and distance education providers such as institutions received equal time. Institutions, associations, and organizations representing distance education rallied to the challenge. Early reports about the study were mixed and it was feared that the tremendous resources of copyright owners would skew the report against distance education but this was not to be the case. The Copyright Office report proved to be responsive to the interests of copyright owners as well as users of copyrighted materials to balance use and access. It contains many recommendations and proposed copyright law revisions which address the needs of distance education. The report can be downloaded at the U.S. Copyright Office website. Readers should note that the report is not law and contains recommendations. Current law is problematic for distance education and interested parties should read the report and perhaps contact Congressional members with letters of concern or support. Some of the highlights from the report are as follows from the Crews summary document at the Copyright Management Center:

1. Expand coverage of rights to meet technological necessities.
2. Allow performances and displays in the context of "mediated instruction."
3. Expand the scope of allowed materials.
4. Eliminate the requirement of transmitting the educational experience solely to classrooms and similar places.
5. Implement safeguards to reduce risks to the copyright owners.
6. Allow retention of a copy of the distance education program on a server for duration of the course with access limited to students enrolled in the course.
7. Continue to apply fair use to activities outside the exemption for distance education.

Copyright Term Extension Act (P.L. 105-298, Stat. 2827)

This controversial law has added twenty more years of copyright protection to works which would have entered the public domain and extended copyright protection to life of the author plus seventy years. There are some library, archive, and educational institution exceptions under this law. For example, during the last twenty years of copyright protection, institutions may copy, distribute, perform, and display works in digital or facsimile form provided that it is for purposes of preservation, scholarship, or research. The institution must have determined that: the work is no longer subject to normal commercial exploitation; a copy or phonorecord can not be obtained at a reasonable price (not "rare price"); and the copyright owner or designated agent provides notice that these conditions apply.

Summary

This brief paper has set forth some ideas to provoke discussion and perhaps policy development for intellectual property issues, particularly copyright, which need to be addressed by institutions of higher education and faculty in order to maintain the flow of good materials in a changing electronic environment. Failure to discuss and address these issues may result in a curbing of creativity and much antagonism on the parts of faculty and their institutions. Many models and points for discussion exist which can lead to successful negotiation of ownership issues. In addition, readers have read a brief overview of salient copyright legislation and reports for 1998 and 1999. Links in the resource section at end of the paper may be explored for additional information and recommendations.

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Burk, Dan L. Ownership of Electronic Course Materials. *Cause/Effect*, fall, 1997.
www.cause.org/cause-effect/cause-effect.html

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http://www.cetus.org

Crews, Kenneth D. Limitations on Exclusive Rights of Section 108: Reproduction by Libraries and Archives, March, 1999. Copyright Management Center: Indiana University-Purdue
http://www.iupui.edu/~copyinfo/home.html

Crews, Kenneth D. Summary of U.S. Copyright Office Report on Distance Education, June, 1999. Copyright Management Center: Indiana University-Purdue
http://www.iupui.edu/~copyinfo/home.html

Dyson, Esther Intellectual Property on the Net. *Release 1.0*.
http://www.eff.org/pub/Intellectual_property/ip_on_the_net.html
no date

Dyson, Esther, Intellectual Value. *Wired*, March, 1997.
http://www.wired.com/wired/3.07/features/dyson.html

Dyson, Esther. *Release 2.0: A Design for Living in the Digital Age*. New York: Broadway Books, 1997.

Lide, Casey. What Colleges and Universities Need to Know about the Digital Millenium Copyright Act. *CAUSE/EFFECT*, 22:1, 1999.
http://www.educause.edu/ir/library/html/cem9913.html

Roccia, Vincent. What's Fair is (Not Always) Fair on the Internet. *Rutgers Law Journal*, 29:1.
http://www-camlaw.rutgers.edu/publications/lawjournal/rocciahtm.htm

Thompson, Dennis P. Intellectual Property Meets Information Technology. *Educom Review*. 34:2 p. 14-21

Resource List

Materials dealing with intellectual property globally are abundant and quite easily located via the World Wide Web. The materials selected for inclusion in this list are by no means comprehensive. Sites were selected because they provide unique information and/or links to many additional resources on a variety of intellectual property topics issues, and perspectives. Readers may follow links in the resources to obtain more information.. Sources are current as of in September, 1999.

Print Materials by the author:

Bruwelheide, Janis H. (1994). Copyright Concerns for Distance Educators, in Willis, Barry. *Distance Education: Strategies and Tools*, Educational Technology Publications.

_____(1997). Copyright: Opportunities and Challenges for the Teleinstructor, in Cyrs, Thomas. *New Directions for Teaching and Learning: Distance Education*. Jossey Bass

_____ (1997). Myths and Misperceptions, in Gasaway, Laura. *Copyright Growing Pains.*

_____(1995 reprinted with 1997 update). *The Copyright Primer,* 2nd edition. Chicago, IL: ALA Editions, American Library Association, Chicago, Il . http://www.ala.org

World Wide Web Source List:

Consortium for Educational Technology in University Systems:

CETUS Discussion Series
http://www.cetus.org

Fair Use of Copyrighted Works

Information Resources and Library Services for Distance Learners
Ownership of New Works at the University
The Academic Library in the Information Age

Copyright Crash Course, University of Texas
http://www.utsystem.edu/OGC/IntellectualProperty

Copyright Management Center: Indiana University-Purdue
http://www.iupui.edu/~copyinfo/home.html

Copyright and Universities: WWW and Gopher Sites
http://www.arl.org/scomm/copyright/UniCopy.html

Copyright Office, Library of Congress:
http://lcweb.loc.gov

NEW Copyright Basics, Circular 1
http://www.loc.gov/copyright/circs/circ1.html

Reproductions of Copyrighted Works by Educators and Librarians (circular 21)
http://lcweb.loc.gov/copyright/circs/circ21.pdf

Fair Use Center
http://fairuse.stanford.edu

Digital Millenium Copyright Information (DMCA)

Note: See also the Copyright Crash Course and the Copyright Management Center previously listed for additional interpretations of the DMCA.

American Library Association: Washington Office (select copyright)
http://www.ala.org/washoff

Educause Current Issues: DMCA Guide
http://www.educause.edu/issues/dmca.html

Sample Intellectual Property Policies in the United States:

Carnegie Mellon:
http://gollum.mac.cc.cmu.edu/univ_policy/documents/IntellProp.html

Copyright Resources Online:
http://www.library.yale.edu:80/~okerson/copyproj.html

Copyright Resources Online -- Policies
http://www.library.yale.edu:80/~okerson/copyproj.html#ucopy

Library Issues:

Electronic Scholarly Publication:
http://www.arl.org/transform/esp/index.html

Electronic Reserves:
http://www.research.umbc.edu/aok/reserve.html

Faculty Guidelines:
http://www.lib.umich.edu/libhome/Reserves/faculty/faculty.html

Liblicense:Licensing Digital Information:
http://www.library.yale.edu/~Llicense/index.shtml

Licensing:
http://www.arl.org/scomm/licensing/licbooklet.html

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Abstract

Category: Papers Presented at EDUCAUSE annual conferences

ID Number:	EDU9938
Title:	IT Literacy for General Education and Online Community
Author:	Shelley K. Hughes, Jeremy J. Shapiro, John S. O'Connor, James B. Young
Organization:	The Fielding Institute, George Mason University
Year:	1999
Abstract:	The informatization of higher education and the development of on-line learning communities have created new literacy needs: for information literacy per se and for the cognitive and social skills that enable learners not only to function effectively in technology-rich environments but to become effective members of technologically based communities. Representatives from the Fielding Institute and George Mason University discuss IT competency in general education as well as the last and hardest information literacy skill -- community literacy.

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Session Title: IT Literacy for General Education and On-line Community
EDUCAUSE
Presentation Time: Friday, October 29, 1999. 9:30 am
Room 104C, Convention Center

Shelley K. Hughes
Director, On-Line Academic Environment
The Fielding Institute

John S. O'Connor
Dean, New Century College
George Mason University

Jeremy J. Shapiro
Senior Consultant, Academic Information Projects
The Fielding Institute

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ABSTRACT: The informatization of higher education and the development of on-line learning communities have created new literacy needs: for information literacy per se and for the cognitive and social skills that enable learners not only to function effectively in technology-rich environments but to become effective members of technologically based communities. Representatives from the Fielding Institute and George Mason University discuss IT competency in general education as well as the last and hardest information literacy skill-community literacy.

Presentation Speaker Summary

Session Title: IT Literacy for General Education and On-line Community

Shelley K. Hughes
Director, On-Line Academic Environment

Jeremy J. Shapiro
Senior Consultant, Academic Information Projects

The Fielding Institute
2112 Santa Barbara Street
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Summary Title: On-Line Community Literacy: the last and hardest information literacy skill

While virtual, on-line, academic community has its pluses, especially in overcoming geographical distance and creating new, exciting forms of interaction and learning, it has been accumulating both its detractors and its social and psychological problems, from sexual harassment through "flame wars" to simple time-wasting and information overload. The problems often have to do with behavior in shared spaces. Although occasionally this may consist of outrageously deviant behavior, the more general issue is not knowing how to participate constructively in on-line community. What good is information literacy if it is disconnected from perhaps the only kind of literacy that ultimately counts: knowing how to be responsible member of a community?

The concept of literacy usually takes the individual as a frame of reference: an individual possessing or needing to acquire a set of cognitive skills. But community requires a set of social skills through which the individual is socialized to take a larger-than-individual perspective toward her/himself; and literacy for on-line community requires this perspective to be translated into its IT analogues. For example, an individual may be information-technology literate, in the solitary sense, by virtue of being able to create a document with a word-processing program; but if she does not know how to export it in a file format that can be easily read by others, she is not IT-literate in a community sense. A faculty member may know how to upload a message to an on-line discussion with students she has never met. But if she does not know how to frame that message in a way that takes account of different students' on-line contexts and make them feel that their virtual presence is acknowledged, she is not community/IT-literate.

Community is about sharing -- of assumptions, of context, of culture, of skills, and of knowledge -- about being to perceive oneself and one's own behavior from the perspective of individual others and of the group as a whole, and about being aware of one's impact on others and modifying one's actions in accordance with both anticipated and real impact. In on-line environments, all of these dimensions of community take on unique forms: how one shares, how one knows whether one shares, how one's actions impact on others, how one is perceived by others all have distinctive features in cyberspace as they are mediated by information technologies.

Our experience with the Fielding Institute's on-line academic environment has led us to pay special attention to mental models built into groupware systems and their assumptions about culture and community; corresponding criteria for evaluating software systems that take account of those models and assumptions; developing a complementary relationship between computer-mediated and face-to-face interaction in the same institution; infrastuctural and strategic-planning issues that affect the quality of community but are invisible to the user; the explicit development of community norms and cultural values in the on-line environment; technical skills that facilitate community building; and the role of explicit "on-line culture and community.

Presentation Speaker Summary

Session Title: IT Literacy for General Education and Online Community

Jim Young
Librarian and Director of Technology Across the Curriculum Project
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Summary Title: Information Technology Literacy: Instruction, Assessment, and General Education at New Century College

New Century College (NCC), a competency-based, integrative program at George Mason, is addressing IT literacy from an integrated approach. *Information Technology* is one of the college's nine competency areas that students are required to master. As part of NCC, students experience "team-teaching, collaborative projects, emphasis on writing and critical thinking, opportunity for independent study, and experiential learning integrated with the community are all important parts of learning communities" . Students learn a progression of technology skills throughout the first year program and continue their learning in technology-intensive upper level courses. In NCC, students are introduced to the application and use of information technology through a combination of learning modules, hands-on computer laboratories, in or out-of-class assignments and self selected learning opportunities. Learning focuses on the fundamentals of IT and applying IT concepts in integrated assignments and projects. This IT curriculum focuses less on the "nuts and bolts" of specific computer applications and more on ways to apply information technology to assignments or projects.

In reality, most universities are not organized like New Century College. Many universities are still organized around the "technology requirement" where students are required to take a particular technology course. If the university is going to play a strong role in preparing student's for IT literacy they will need to be a move toward the offering of programs where learning and assessment become more central and student contact with IT is meaningful, sustained and interwoven throughout a student's chosen program of study.

Becoming information technology literate encompasses making connections, relating concepts from one situation to another, the ability to apply knowledge and appreciate change. The most effective way to evaluate a student's knowledge – the complex set of skills encompassed in IT literacy – is to offer a battery of closely integrated options where students will be required to demonstrate and articulate their understanding. Assessment should not be limited to classroom assessment techniques or large-scale programmatic assessment. Students should also have wide access to "self-selected" options to assess and certify their knowledge and skills. Moreover, the "assessor" does not always need to be the classroom instructor. Unlike "clean and convenient" multiple choice, machine graded exams, a more holistic approach to assessment will take more time and resources. Assessment should not be limited to a reliance on "numbers". In the end, integrated and multidimensional assessment options should become as pervasive and transparent as information technology itself.

Presentation Speaker Summary

Session Title: IT Literacy for General Education and Online Community

John O'Connor
Dean
New Century College
George Mason University
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Fairfax, VA 22030-4444

Summary Title: Information Technology Literacy, Faculty Development, and Learning Communities

Defining and assessing Information Technology Literacy has been an important process for faculty development. It has encouraged faculty to face distinctions of skills, competencies and knowledge. It has confronted them to think with their own learning processes as they have learned information technology themselves. It has fostered new ways of creating community that bridges faculty, staff and students.

Originally, Information Technology (IT) was not a required competency in the Integrative Studies degree in New Century College. The thinking was that IT would be so pervasive in teaching, learning, and administration within the college that a formal requirement was unnecessary and that position was a statement of NCC ideals and commitments: you don't have to require something that is assumed. We were naive. Faculty and student experience, aptitude, and interest in IT varied so significantly, we were not able to assume a pervasive use of the tools and knowledge base. There was also external pressure for the degree to recognize explicitly IT as a competency, and have the degree as certification of it.

The resulting faculty and curriculum development projects meant that we had to be clearer about what we meant by Information Technology competency. Jim Young's work and leadership over the past few years has enriched the issues of definition and assessment. It has been one more factor in faculty collaboration and in community-building among professional staff, students, and faculty. Because the subject is still new, challenging, and changing, it creates an atmosphere of "we are in this together"-from wrestling with definitions, requirements, and assessment to actually learning our way in the this new subject. Just as we develop student teams where the grade is dependent on how much the least knowledgeable student in the group learns, so have faculty recognized that they can't opt out if the are part of an instructional team. Of course, that creates tension; it also creates community. It also creates opportunities for librarians and learning technology staff to become more equal partners in the academic enterprise. Within NCC, there is not the hierarchy of roles and distinctions of class that can permeate the academy. There are multiple reasons for this integration, but the centrality of IT-and our attempts to create complex definitions and assessment --is one of the more important reasons. In addition, because of the range of ability and interest in students, they too become partners. This term, we have students offering supplemental workshops in web authoring. The students offering the workshops want their peers to be able to do more than we are teaching. This creates new opportunities and possibilities for collaboration that profoundly enhance our goals for learning communities that extend beyond class walls and times.

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Transforming Education Through Information Technologies

Abstract

Category: Papers Presented at EDUCAUSE annual conferences

ID Number: EDU9902

Title: Meta Data Integration: Maximize the Potential of 'Data about Data'

Author: Barbara Hope, Maribeth Mattingly, Eric Spear, Mike Glasser

Organization: University of Maryland

Year: 1999

Abstract: The University of Maryland, College Park recognized in the 1990's that it's institutional data was an asset that needed to be managed. In this Information Age data must be turned into knowledge quickly and accurately. The University of Maryland implemented a campus data warehouse and along with it a comprehensive meta data platform for helping individuals understand the meaning and context of the data they were accessing. With limited resources it was apparent that meta data needed to be captured at a single point of entry and it needed to be available or delivered to multiple points of distribution. This paper gives an overview of how the University of Maryland Meta Data Manipulator works and how it allows for the meta data to be integrated with the data warehouse structures and the tool used to query the data.

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Meta Data Integration:
Maximize the Potential of 'data about data'

Barbara Hope, Data Administrator

Maribeth Mattingly, Assistant Data Administrator

Eric Spear, Data Base Administrator, Institutional Research

Mike Glasser, Data Base Administrator, Operations and Enterprise Applications

University of Maryland
College Park, Maryland

Abstract

The University of Maryland, College Park recognized in the 1990's that it's institutional data was an asset that needed to be managed. In this Information Age data must be turned into knowledge quickly and accurately. The University of Maryland implemented a campus data warehouse and along with it a comprehensive meta data platform for helping individuals understand the meaning and context of the data they were accessing. With limited resources it was apparent that meta data needed to be captured at a single point of entry and it needed to be available or delivered to multiple points of distribution.

This session gives an overview of how the University of Maryland Meta Data Manipulator works and how it allows for the meta data to be integrated with the data warehouse structures and the tool used to query the data.

Introduction

As data are widely distributed throughout an organization, it is critical to understand the meaning of the data and the context in which they are presented. The University of Maryland's Office of Data Administration (ODA) was charged with identifying institutional data elements, defining them, indicating who had responsibility for them and educating the campus community in the use of these institutional data elements. ODA designed a single source meta data application which enabled the office to leverage the comprehensive "data about data" and make it readily available, in multiple ways, to the users. A web-based application, using a Java applet for easy browser access, enables the office to catalog standardized data elements, their definitions, examples, supplementary definitions, keywords, data subsets, transaction system data, and associated code sets. Via the application, data are entered into Oracle relational tables and leveraged with other systems. Data definitions and codes sets are accessed real-time when customers query the University of Maryland Data Warehouse (DW) using the campus client server tool. The same meta data are also accessible to non-warehouse users via a data definition search tool on a campus web site.

By utilizing features in Brio Technology's query products, ODA is able to make meta data available to users as they write queries, increasing their ability to understand the data and more accurately construct a query. Part of ODA's mission is to educate the campus regarding the meaning and use of institutional data elements. ODA believes the education process is best served by having one point of entry and cataloging of meta data and multiple methods of distribution.

This complete integration of meta data allows for the delivery of meaningful information to all types of users, greatly enhances the ability to educate users, provides a contextual reference for querying, and increases the overall friendliness of the warehouse. In addition, it has created an encyclopedia of knowledge for the organization. Because information is an asset of the organization, it needs to be managed and made available throughout the organization.

Background

The University of Maryland (UM) is the flagship campus of the University System of Maryland (USM). As the comprehensive public research university for the State of Maryland and the original 1862 land grant institution in Maryland, UM has the responsibility within the USM for serving as the state's primary center for graduate study and research, advancing knowledge through research, providing high-quality undergraduate instruction across a broad spectrum of academic disciplines, and extending service to all regions of the state. It has a current Carnegie Classification of Research Universities I. The University is located in College Park, Maryland, five miles from Washington D.C. There are 24,454 undergraduate students, 8,257 graduate students, 315 campus departments, 13,136 permanent faculty, staff, and graduate assistants, and 4,000 hourly student employees.

The Office of Data Administration (ODA) was created in 1996 from a CQI effort that recognized that institutional data was an asset that needed to be managed. The Office reports to Operations and Enterprise Applications, one of three major subunits of the Office of Information Technology. It consists of two FTEs that manage the data administration function and the UM Data Warehouse. ODA's mission is to manage the institutional data of the University of Maryland to provide reliable, accurate, secure, accessible data to meet the strategic and management needs of all levels of the campus. The DW is one mechanism for meeting ODA's mission and providing a platform through which the campus meta data "encyclopedia" of data knowledge is distributed.

The first movement towards data warehousing at the University of Maryland, was a proof-of-concept project. An operational system existed to support faculty appointments on campus; however, no effective query mechanism was available. The DW began as a grass roots effort to prove that the DW concept was viable. The success was immediate and the project began to expand, into the personnel arena, contract and grants, student systems, payroll, financial accounting, and budget.

Data for the UM Data Warehouse are extracted from IBM 3090 and HP 9000 transaction databases (DataCom/DB and Image) via in-house programming. Data are loaded into Oracle 8.0 databases on AIX and Unix servers. Campus users with Windows, Mac and UNIX desktops access the data via SQLNET over the campus TCP/IP network.

The University of Maryland DW architecture began with a comprehensive "atomic" level infrastructure from which data marts were built. ODA felt that if it could provide all of the data from the institutional operational systems, then the building blocks would be in place to move up the pyramid to create data marts, data views, and an executive information system. This approach takes longer to implement, but ODA has been very satisfied with this decision. Because a full data subset is brought into the "atomic" level all at once, queries can be run against the subset and joined to other existing subsets. This results in an immediate "win" for the users. It allows for incremental deployment of subsystems rather than waiting for the entire complement of campus data subsets to be added. *Figure 1*

As the "atomic" level data infrastructure was made available via the DW, a method for educating the users in the understanding and use of the data was necessary. ODA provides the campus community with query tool training and also requires users to attend a data training class for each data subset to which they have been given access (i.e., registration, payroll, personnel…). In the process of training users, it was apparent to ODA that readily accessible information about the data and its source was necessary. At the same time the DW development was occurring, ODA was researching and cataloging data definitions and source information about institutional data elements. ODA's goal was to integrate this Meta Data Encyclopedia with the DW and other information delivery mechanisms, in order to track attributes about the "atomic" data elements and greatly enhance user understanding and use of the DW data elements. The resulting Meta Data Encyclopedia is available through all levels of the DW data architecture. *Figure 2*

What is Meta Data and Why is it Important?

Meta Data is information about the data that make up the institution's data infrastructure. Meta data, as the University of Maryland defines it, includes element definitions, policies that may have an affect on the data, keywords to aid in web searching, operational system origins, programming logic where applicable, element code values with descriptions, and units responsible for each element. By building a meta data encyclopedia, the Office of Data Administration is managing the data asset of the campus. Meta data catalogs information about the elements that support the institutional systems of the campus. Until the formation of the Meta Data Encyclopedia, much of the institutional data knowledge resided in the heads of a dozen or so long time campus employees. It was acknowledged that turnover of these personnel would result in a loss of institutional history and memory. And so the UM Meta Data Encyclopedia was born. It differs from the traditional data element dictionary in that it contains detailed definitions of data elements and provides contextual references. It is not uncommon for a definition to be several paragraphs long. Cataloging of the institutional elements attributes has the immediate effect of educating the entire campus community and preserving the data for the future. We cannot afford to have the data asset leave the campus as individuals leave the campus. In addition, with business process re-engineering efforts and implementation of fully integrated administrative application systems, understanding of the data and their relationship across processes is crucial.

Integrated Delivery of Meta Data

The collection and recording of meta data is a monumental task. It may take weeks of researching policy, combing through data dictionaries, and interviewing functional experts to collect the information needed. The magnitude of the process dictated that meta data be entered once, and only once, into a single source database. It needed to be available not only to ODA, but to service offices, the Office of Institutional Studies, to users of the data warehouse and to the general campus community. ODA's goal was to make it available to DW users via their query tools and to campus constituents via a web search. The meta data encyclopedia needed to support the entire campus infrastructure.

As we began to catalog meta data, there were a limited number of products available on the market. Those that were available were financially beyond the means of our campus. Meta data were originally kept in WordPerfect files as a stop gap measure until a database application could be developed. ODA developed the data model for what would become the Meta Data Encyclopedia and partnered with a database administrator who on his own time developed what is called the Meta Data Manipulator web application. It has become the cornerstone of our meta data cataloging.

The Meta Data Manipulator was built by constructing Oracle tables to hold the meta data. A Java application was written that provides the Office of Data Administration with a single point of entry for all the various meta data components (short and long definitions, subset relationships, keywords, operational systems origins, supplementary technical definitions, and code value translations).

By storing the meta data in Oracle tables, it is considered one of the DW subsets, and our query tool is used to create meta data reports, just as it can be used to create reports for other DW data. Not only are the data definitions immediately accessible via the tool, the translations for the code values are as well. Gone are the days when users needed to have lists or books of codes and their translations next to their computers for reference. It is now all at their finger tips. For example, the code of "01" in a DW element called Category Status Cd (code) is described as "Faculty, Tenured" in the corresponding descriptive DW element called Category Status. The codes with their translations for these elements are available within the tool while composing the query. For Category Status each and every available code and translation will be listed in a window.

The meta data infrastructure allows us to integrate the meta data via the DW query process, ODA's URL, and via Oracle for ad hoc reference and reporting. Efficiency has been achieved by inputting the meta data only once at the source and distributing it in multiple ways. It is not only available for our DW customers, but it is available for anyone on campus who has a need to know about data. *Figures 3 and 4*

A unique part of the meta data delivery to the campus is through the query tool which our campus chose. Several years ago, the BrioQuery client server query tool, from Brio Technologies, was selected by the campus as the tool that ODA would support for accessing data in the DW. Although any tool that is SQL compliant can be used, ODA supports, offers training for, and provides helpdesk coverage only for the BrioQuery product line. By using the BrioQuery product, a user takes advantage of the available meta data definitions/remarks and lookup codes with code definitions. The BrioQuery product has a mechanism that allows us to reference our meta data Oracle tables and display the information in them. While using BrioQuery, a user can lookup the data definitions for both tables and elements directly from the Meta Data Encyclopedia. There is also a mechanism that allows us to link our tables containing codes and their translations with the BrioQuery tool. This has meant that while users write their queries, they have the encyclopedia of meta data accessible from within the query tool and readily available. This is a huge leap for ODA in it's effort to support and educate the campus regarding the institutional data.

Meta Data Manipulator Design

The Meta Data Manipulator is a Java applet written with Symantec Visual Cafe for Java 1.12. The user doesn't need SQL*Net installed on their client machine to connect to the Oracle server because the thin JDBC classes provided by Oracle to connect directly from the applet to the Oracle server are used.. The applet uses the Netscape security mechanism to get outside the Java sandbox, so it won't run with Microsoft's Internet Explorer. Since all of the meta data cataloging is done by ODA and they use Netscape this has not been a problem for our organization. It might have been a problem if our organization used a different web browser. Since it is a web based product there are no other platform restrictions. It was important to ODA to have the ability to catalog meta data from any machine without special hardware/software requirements. Using the browser as the means to access the application enabled this functionality.

The Manipulator contains many features that make the cataloging of data easy and efficient. Data elements are displayed in a scrollable, alphabetic list with indicators denoting if an element does not contain a definition, cannot be found in the UM Data Warehouse, or is a table as opposed to a data element. Data definition text boxes utilize cut and paste features from within the application as well as external to the application. A tab feature enables easy movement amongst attribute types within an element, such as definition, examples, source data, and supplementary information. *Figures 5-9* Functional buttons enable features such as create new element, delete element, rename element, save data, keyword assignments, and subset relationships, and exit. Scrollable lists of data subsets can be associated with data elements. These subsets correlate to the University's data management structure and enable the cataloging of data elements associated with a responsible data steward. Because a data element can be used by more than one transaction system, source system data is cataloged by the source system in which it is located. For each data element and its transaction system, the following are recorded: element name in source system, format and length of data element in source system, machine on which source system is located, system name, and the table name in the source system. This feature is extremely beneficial in locating common data elements across campus transaction systems. It facilitates the process of standardizing data across these systems.

Behind the applet is a set of Oracle tables and views that interface with the Meta Data Manipulator. These tables contain the Remarks (short definition for the element), Examples, Supplementary Definitions (long definition for the element), Transaction system origins, and Attributes (keywords, subsets, security sensitivity). These are populated and maintained by ODA using the Meta Data Manipulator.

There are other tables that map the DW elements to their codes and translations so the user can easily get a list of the data element's code values and associated descriptions within the BrioQuery tool. ODA found that limiting queries on codes alone had little meaning for campus functional users. Limiting queries on descriptions introduced erroneous data subsets when descriptions were misspelled or ordered differently. The solution was to display codes and their descriptions at the same time. The Manipulator allows for the establishment of this Lookup mapping. Without this mapping, an element with a code would only show the available codes to the user without meaningful translations. The Lookup feature of the Manipulator *(Figure 10)* uses a table that contains, for each element, a table identification, the value code, and a short and long translation. We load the code tables from our transaction systems to the DW nightly. An example of an entry in the code table that translates the category status (faculty, staff and student employment categories) element:

Table Id	Code	Short	Long
HRCIVS	01	Fac Tenured	Faculty, Tenured
	02	Fac On-Track	Faculty, On Tenure-Track
	03	Fac NT-Term	Faculty, Non-Tenured, Term Only

Another table that completes the capability to "lookup" the code with its translation allows Data Administration to attach the Table Id to an element. At the same time Data Administration chooses what they would like to display for the user to see in BrioQuery. This might be the code and its short translation or the code and its long translation, or just one of the translations. An example of the mapping of elements and table ids:

Element	Table	Type of Display
CATEGORY_STATUS_CD	HRCIVS	COMBINED (combines the code with the short translation)
CATEGORY_STATUS	HRCIVS	COMBINED LONG (combines the code with the long translation)

Connecting the Meta Data to BrioQuery

BrioQuery provides the mechanism for each connection to indicate where the data element remarks can be retrieved and where the code "lookup"descriptor records can be found. This is a feature of the BrioQuery product that has allowed us to customize the product to fit the campus' needs. The goal is for the presentation and use of the DW to be as friendly and easy as possible. It is not a platform designed for the typical programmer. It is a platform designed for a typical business manager on campus. *Figures 11 and 12.*

Ti[illegible] Data Delivery Approach

ODA's ultimate goal has been to provide the mechanisms to meet the different functional needs of our campus users. The "atomic" level is for those individuals who want to learn the data intricacies and "explore" and analyze the data in depth through ad hoc query building. Data marts and a pre-written repository of queries are for those individuals who want information, but do not have the time to invest in learning all of the details of the "atomic" level. These individuals are our "consumers" or "farmers". The final type of individuals who need information are our executives. They want to click and get immediate answers at their desktops. They cannot invest the time to attend query training or data training. They need pre-written queries that deliver answers to business questions and provide trend analysis for decision making and strategic planning. For this functionality, we deliver web reports at the click of a mouse and have been able to provide the front-end to our DW and establish a true executive information system infrastructure. *(Figure 13)* The Brio Technology suite of products has enabled us to provide this tiered data delivery approach while at the same time incorporating the knowledge from our Meta Data Encyclopedia. To further serve the campus community, ODA has developed a data definition web search that enables campus users to search for data elements in the Meta Data Encyclopedia from ODA's web site. A search results in a display of all relevant data elements and the meta data attributes cataloged for each element. (*Figure14 & 15*)

Conclusion

By responding to the charge that ODA provide accessible information to the campus, the office moved forward to find an integrated solution. As data were made accessible via the DW, meta data had to accompany the process. Limited staff resources required that the capture of meta data be streamlined. It had to be entered once but distributed easily to various applications. The java application via the web provided the mechanism for capturing and maintaining the meta data. Brio Technologies' Brio Query product line (client server and web server) has made it possible for the meta data to be integrated into the query and reporting tools. Last but not least, the campus has provided a web meta data search mechanism for individuals on campus that wish not to use the Brio product, but need to understand the institutional data. In a DM Review article, Michael H. Brackett summed it up very appropriately, "A data resource is the heart of an intelligent, learning, information-driven public or private sector organization. Operational data, historical data, analytical data, predictive data, and meta data are all part of that data resource and must be formally managed and integrated within a common data architecture to provide high-quality, meaningful support to the business." The University of Maryland agrees and has taken steps to fully integrate the meta data into the overall data architecture on the campus. So far it seems that this approach has produced meaningful results for many and is proving to be a correct design.

Meta Data Integration:Maximize the Potential of 'data about data'

Figures

Data Administration, University of Maryland, College Park, MD

Figure 1

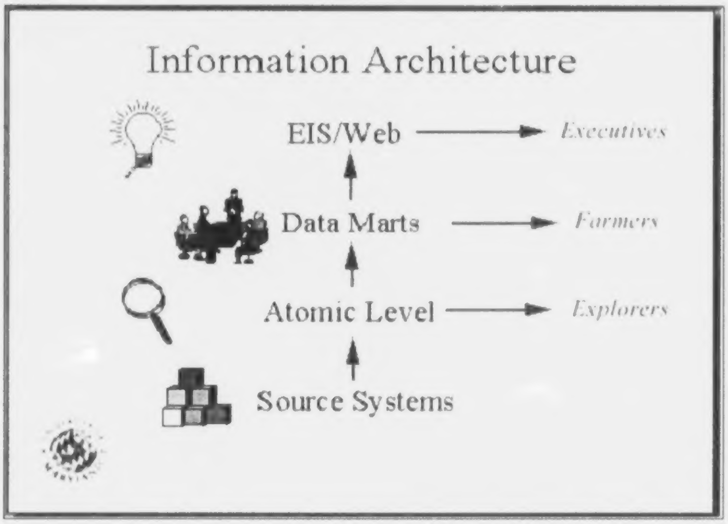
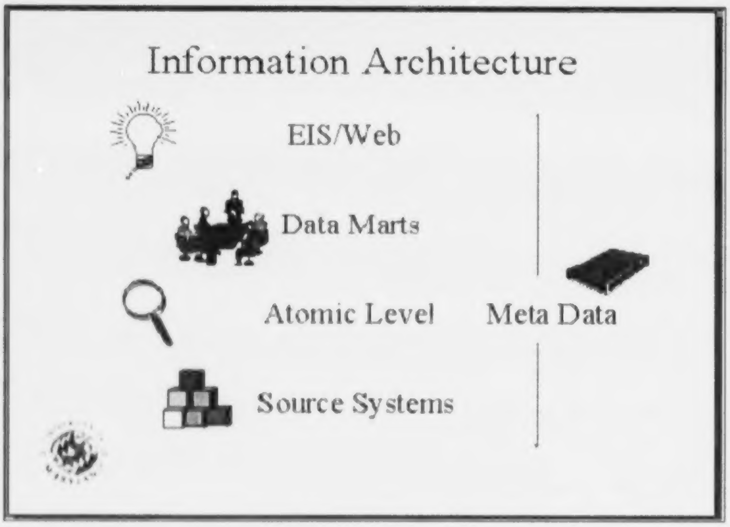


Figure 2



Information Architecture

EIS/Web

Data Marts

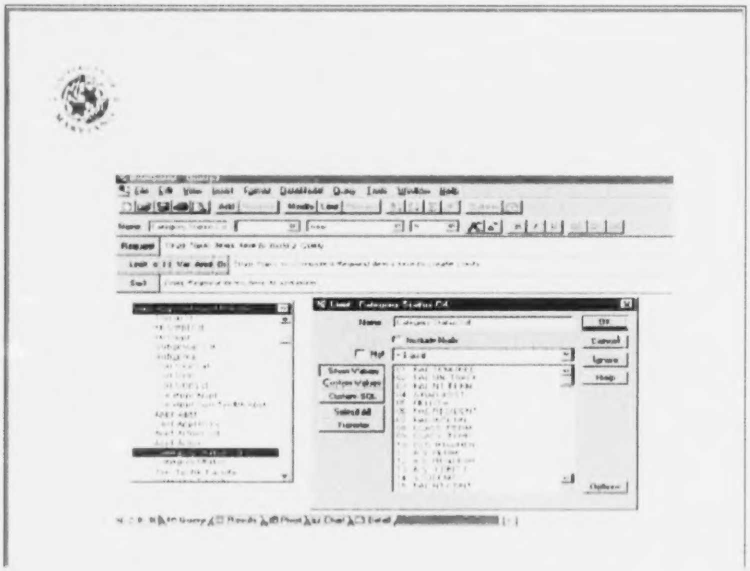
Atomic Level

Source Systems

Meta Data

Figure 3

Figure 4


Request
Sort
Name
OK
Cancel
Ignore
Help
Show Values
Custom Values
Custom SQL
Select All
Options
Query
Results
Pivot
Chart

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330

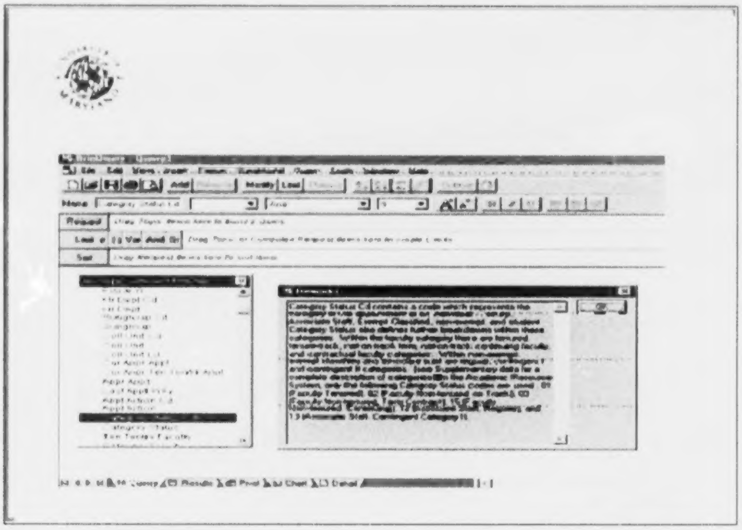

Figure 5

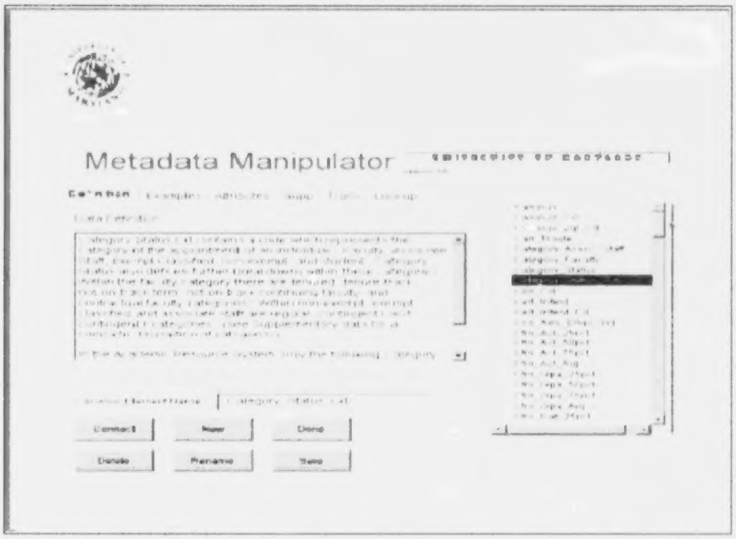
Metadata Manipulator
Connect
New
Done
Delete
Rename
Save

Figure 6

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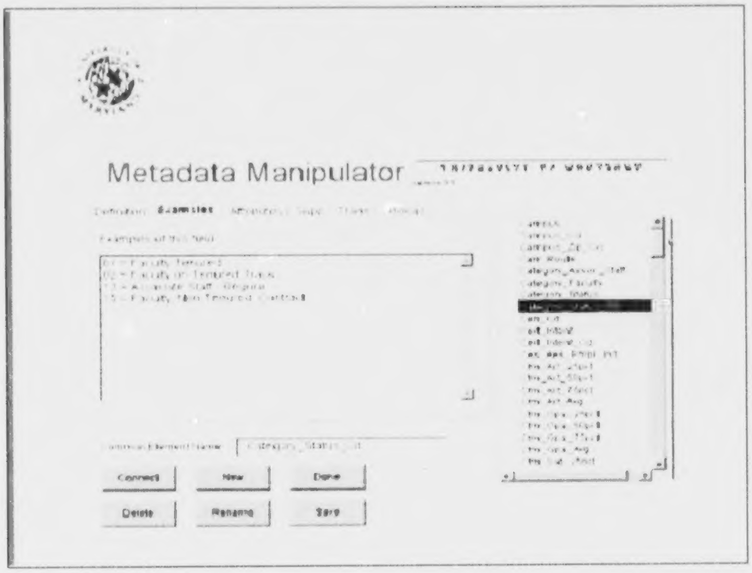
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Connect
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Done
Delete
Rename
Save

Figure 7

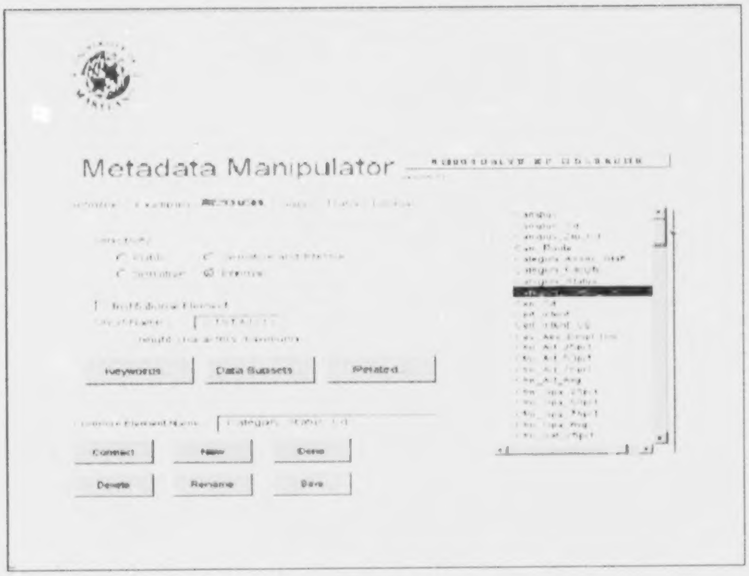
Metadata Manipulator
Keywords
Data Subsets
Related...
Connect
New
Done
Delete
Rename
Save

Figure 8

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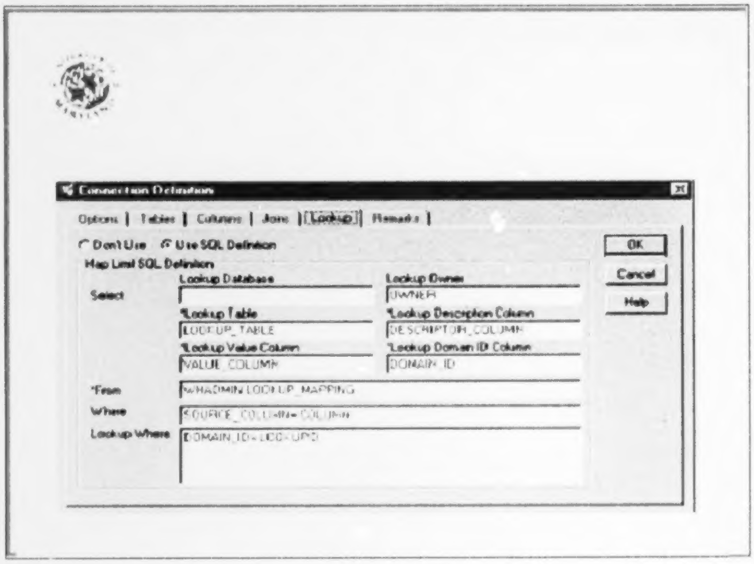
Figure 11


Connection Definition
Options
Tables
Columns
Joins
Lookup
Remarks
OK
Cancel
Help

○ Don't Use ● Use SQL Definition

Map Limit SQL Definition

Select	Lookup Database	Lookup Owner: OWNER
	*Lookup Table: LOOKUP_TABLE	*Lookup Description Column: DESCRIPTOR_COLUMN
	*Lookup Value Column: VALUE_COLUMN	*Lookup Domain ID Column: DOMAIN_ID

*From: WHADMIN.LOOKUP_MAPPING
Where: SOURCE_COLUMN=:COLUMN
Lookup Where: DOMAIN_ID=:LOOKUPID

Figure 12

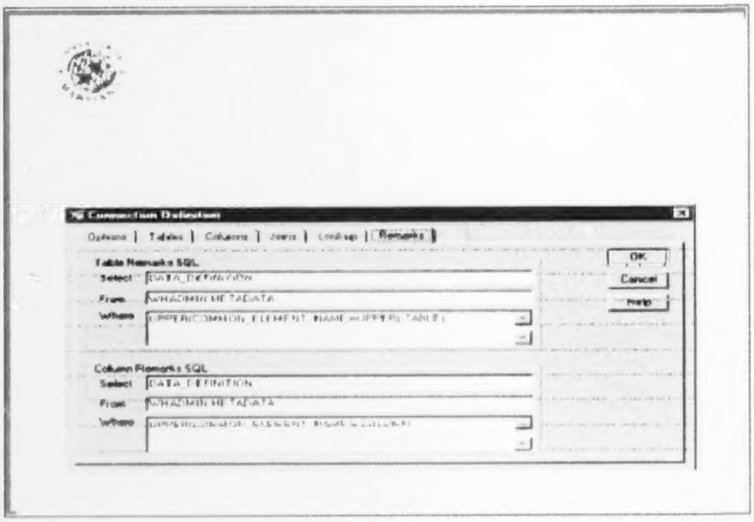

Connection Definition
Options
Tables
Columns
Joins
Lookup
Remarks
OK
Cancel
Help

Table Remarks SQL
Select: DATA_DEFINITION
From: WHADMIN.METADATA
Where: UPPER(COMMON_ELEMENT_NAME)=UPPER(:TABLE)

Column Remarks SQL
Select: DATA_DEFINITION
From: WHADMIN.METADATA
Where: [illegible]

Figure 13

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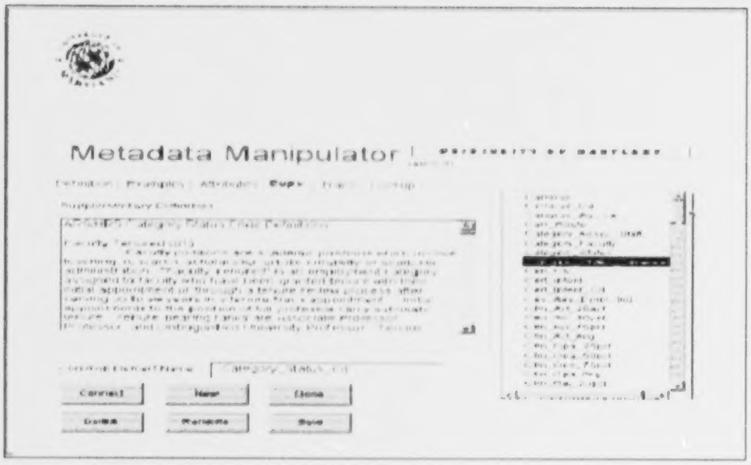
Metadata Manipulator
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Examples
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Figure 9

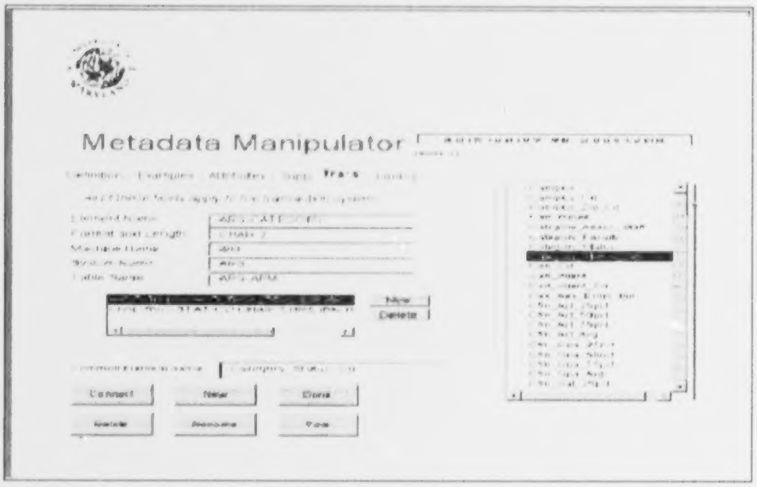
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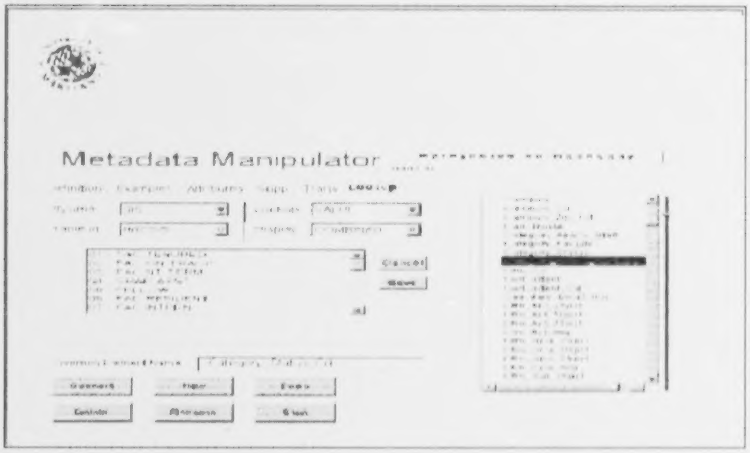
Figure 10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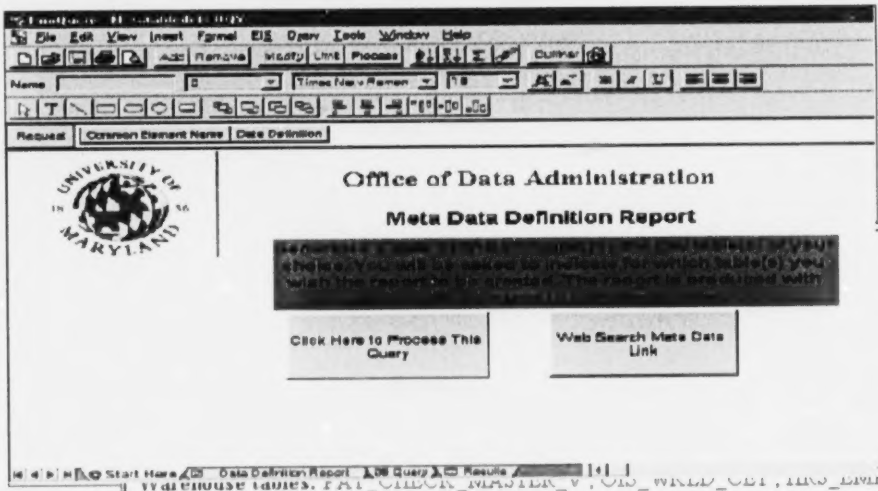
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Outliner
Name
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Data Definition
Office of Data Administration
Meta Data Definition Report
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Start Here
Data Definition Report
Query
Results

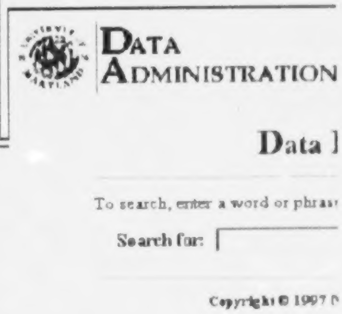
DATA
ADMINISTRATION
Data]
To search, enter a word or phras
Search for:
Copyright © 1997 I

Figure 14

Warehouse tables: PAY_CHECK_MASTER_V ; OIS_WKLD_CET ; HRS_EMP
HRS_EMPLOYEE_GENERAL ; HRS_EMPLOYEE ; COMBINED_EMPLOYEE_
COMBINED_EMPLOYEE_TITLES_V ; ARS_APPOINTMENT_MASTER ; ARS_APPOINTMENT_MASTER_V ;
ARS_CURRENT_APPTS ; BUDGETED_POSITIONS ; HRS_EMPLOYEE_CRS ; HRS_EMPLOYEE_PHYSPL ;
HRS_EMPLOYEE_V , PAY_CHECK_MASTER

Institutional Element: N

Definition:

Category Status Cd contains a code which represents the category of the appointment of an individual - Faculty, Associate Staff, Exempt Classified, non-exempt, and student Category Status also defines further breakdowns within these categories

EDUCAUSE *Information Resources Library*

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Abstract

Category: Papers Presented at EDUCAUSE annual conferences

ID Number: EDU9911

Title: Mission Impossible: Building a Statewide Student Advising System

Author: Linda Thanasides

Organization: Florida Center for Advising and Academic Support

Year: 1999

Abstract: The public community colleges and state universities in Florida have joined forces to deliver a distributed, platform-independent, Web-based delivery system for educational information. The Florida Academic Counseling and Tracking for Students (FACTS) system is an infrastructure for a statewide network that allows real-time communication between institutions while maintaining the integrity of each institution's host applications. Students at participating institutions are able to retrieve transcripts, receive academic advising, see what is needed to complete a degree at any other institution in the system, construct "what if" scenarios, and make coursework assumptions for educational planning. The system design and FACTS pilot were presented at CAUSE97. Since then, the system has been delivered and is now in the process of being implemented at all Florida public institutions.

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MISSION IMPOSSIBLE: Building a Statewide Student Advising System

Linda Thanasides
Florida Center for Advising and Academic Support
Tampa, Florida

The public community colleges and state universities in Florida have joined forces to deliver a distributed, platform-independent, Web-based delivery system for educational information. The Florida Academic Counseling and Tracking for Students (FACTS) system is an infrastructure for a statewide network that allows real-time communication between institutions while maintaining the integrity of each institution's host applications. Students at participating institutions are able to retrieve transcripts, receive academic advising, see what is needed to complete a degree at any other institution in the system, construct "what if" scenarios, and make coursework assumptions for educational planning. The system design and FACTS pilot were presented at CAUSE97. Since then, the system has been delivered and is now in the process of being implemented at all Florida public institutions.

MISSION IMPOSSIBLE: Building a Statewide Student Advising System

During the 1996 session, the Florida Legislature passed a mandate requiring that the state's ten universities and twenty eight community colleges establish a statewide system infrastructure that would allow students access to their transcripts, assess progress towards a degree, shop for degrees at each of the public institutions, and assess the impact of changing majors or institutions. This was seen as the first phase of a more comprehensive system that would also allow students to apply for admission, research financial aid and career options, obtain distance learning information, register for classes, perform career tracking functions, and pay fees at any public institution from any web browser. The system was requested to be available twenty-four hours a day, seven days a week.

In Florida, a Board of Regents governs the universities; and the community colleges are separately managed and funded entities governed by a State Board of Community Colleges. There is a myriad of systems implemented at each state institution. The universities have a shared advising system infrastructure called SASS (derived from the DARS, Miami of Ohio system), while the community colleges were just developing such an infrastructure at the time the legislation was passed. Each institution has implemented its own admissions, registration, financial aid, and fee payment systems. The community colleges are divided into five different system consortia where all the institutions in a consortium share development and maintenance costs for a set of shared systems. Given this type of statewide organization, the prospect of bringing together the institutions in an organized manner seemed completely unmanageable!

The interest of the Legislature in this issue was brought about by the projected 50% increase in college age students over the next ten years in the state of Florida. Florida has no state income tax plus a voter-driven initiative was passed a few years ago that limits new taxes and fees, so there will be no new institutions to accommodate the projected growth. Of course, it is not known how many of those students will decide to continue their education in Florida, or continue in post-secondary education at all, but it is reasonable to assume there will be a significant increase in demand for higher education in the state. The issue remains in how to deal with that increase.

The Legislature also has concerns about two other trends: 1) the trend for students to take five or six years to complete an undergraduate degree, and 2) the trend for students to take more hours than needed for graduation. (The two are clearly related.) Two state initiatives have been put in place to help improve the "productivity" of the existing higher education system in Florida. One is the "Out in 4" program to encourage students to complete their college education in four years by providing comprehensive academic advising. The other is to begin charging full tuition for "excess credit hours." Excess credit hours are considered any credit hours in excess of 115% of those needed to graduate. However, it became clear that these initiatives themselves would not be enough to speed students through the system.

The developing technologies associated with distance learning offer the promise of providing an alternative form and media for teaching and learning using personal computers and the web. Many states are looking at this option as a way to leverage their investment in higher education. The public is demanding many other services be provided within the boundaries of the existing tax structure, so the possibility of delivering instruction electronically without having to build additional classrooms and campuses is very attractive.

The Florida Legislature is interested in this possibility and has recognized the way to accomplish such a "virtual university" is to leverage the faculty and other resources at the existing thirty-eight state institutions. In order to do this; however, we need a way for students to put together degree programs potentially with pieces from several different institutions. At some point separate accreditation will need to be considered, but that can come later once more courses are available electronically. We must start with the ability of students to easily research and pursue options at the existing institutions. Hence the interest in a statewide student information system.

In the summer of 1996, the Board of Regents and the State Board of Community Colleges hosted several focus sessions with administrators, faculty, students, and parents to gather information about user expectations and requirements for a statewide system. The technical options for a pilot implementation were also considered. Early on it was decided that a web-based delivery system would be the most desirable. A number of existing systems at different institutions were considered for the potential to serve as a basis for the system. Each had some interesting and innovative characteristics, and some may even have been comprehensive enough to provide all of the desired functionality for all of the institutions. However, there was considerable opposition by individual institutions to convert to a new system, and to turn over any responsibility or control for their data and business rules to one central system. It became clear that a distributed system design would be the only agreeable solution.

A pilot project was organized to provide a proof of concept before proceeding with concrete plans (including funding) for development of a statewide system. The Secretary of the Department of Management Services (DMS) was the pilot project manager. This was a logical choice as DMS was responsible for the state's communications infrastructure and the Secretary was a member of a new state entity formed to foster and coordinate distance learning activities in the state. The pilot was funded by dollars allocated to Florida's distance learning initiative. It was deemed important to have a working pilot by the start of the 1997 legislative session so funding could be considered for that year's budget. Since we had only three months to make the deadline, DMS hired several consulting agencies to assist six designated pilot institutions with implementation. In spite of having to deal with the disorganization of many participants, policy issues, hardware issues, and a general lack of consensus, a working pilot was completed at the end of the three months that demonstrated the technical feasibility of a statewide system.

Some of the issues that arose from the pilot are as follows: 1) Accuracy of information--The output from the pilot system did not always match output from the home institutional system. 2) Security of information--There was not enough time to develop an encryption method. 3) Output Format--There were too many institutions that could not agree upon a common output format for degree audits and transcripts. 3) Response Time—The electronic data formats used were inefficient and some of the communication methods were inadequate and slow. 4) Standard Policies for Passing Data—Agreements between the community college and university systems needed to be established for standard data interchange.

Although the original pilot was messy and inefficient, it was a necessary part of getting the statewide system to where it is today. We took what we learned from that pilot and began to build on those experiences to create a sound design for the "real" system. After a demonstration to the legislature, a committee was appointed from the participating pilot institutions and resources from the Board of Regents and the State Board of Community Colleges created an implementation plan and a budget for the statewide deployment of the system. A very important resolution of this committee, and one that is the basis for the project's success, was that all decisions would be a consensus. The budget and project plan was submitted to the legislature and funding was approved. The Florida Center for Advising and Academic Support (FCAAS) was established as the central support staff that would implement and maintain the system. A director was appointed, and the development began at six prototype institutions while hiring for permanent support staff began.

We again had a very short time frame to develop the initial system implementation. Work began in April with a September 1998 production date for the prototype institutions. To staff a project like this that could get the job done in a short period of time required knowledgeable, productive resources to start immediately. In the beginning, the committee submitted a Request for Proposal to find a vendor or vendors that could supply us with a software solution to tie the institutional academic advising systems together. None of the vendors had a total workable solution, so we decided to use our own resources to program a solution. Each of the prototype institutions involved committed technical resources to begin designing and programming while the permanent FCAAS staff was being assembled to eventually take over the system support. Funding was allocated to each of the prototype institutions to provide assistance in replacing resources while the present staff developed the system.

A distributed design was agreed upon that allows the institutions to have full control of their data and processes. The data remains at the local institution, and local applications are run when a request is made for information from a web browser. An interface process from the host application to the communication software handles the response. The request is routed through a central server to a communication server located at the destination institution. That request is recognized at the institution and the institution's local application is run with production data. The response is handed back to the institution's communication server to be either sent to another communication server for further processing or routed back to the requestor's browser for display.

FACTS is designed to interface with any institutional platform. The current platforms with which FACTS interface are MVS mainframe, AS/400, UNIX, and NT. The network interfaces used are TCP/IP, DB2 remote reads (Distributed Relational Database Architecture), and CICS sockets. The communication servers located at all institutions are running Windows NT and use FACTS-developed communication software. Each server also uses an Oracle database for managing EDI formats. IBM Netfinity 5500 servers are being used as the institutional communication servers. They were chosen for speed, reliability, and the ability to monitor the networked servers from a central location. As more and more servers are implemented, monitoring of the system is becoming increasingly more important.

To aid in making the system more useful to administrators and students, "Expert Teams" for each functional area were established to make recommendations for the system. The teams decide what minimum and maximum functionality will be requested of the system as their particular applications are implemented. The expert teams also resolve policy issues as well.

FACTS will provide several benefits to participating institutions. They will benefit from the expertise of the Center staff as they implement at their site. There will be a software package offered with the system that will allow web-page generation for all institutional applications. The institutions can share data from other institutions that has been previously unavailable. All institutions can have a web presence, some maybe faster than they had planned due to the assistance from the central FCAAS staff and state funding for the project. Institutions will also have greater exposure to potential students, both in and out-of-state.

FACTS will provide a great benefit to students as well. Students will have one web address from which to gather information about all institutions. They can gather information without having to go to several campus offices. The system will assist in making all services truly off-campus for distance learning students; and it will allow almost 24-hour-a-day access to student information.

Florida has established the Florida Virtual Campus that will work closely with FCAAS in developing web services for traditional and distance learning students. By providing a one-stop web link for students to gather information on student support services, distance learning courses, and virtual library services, FACTS can assist students in planning almost all aspects of their educational experience.

Since our last presentation at CAUSE97, system functionality has been streamlined, production institutions have been added, FCAAS has been staffed, future functionality has been planned, and implementation for the FACTS network is either completed or well on the way for 28 of the 38 institutions in the Florida public post-secondary educational system. FCAAS has also been working with the private and independent colleges and universities that are interested in joining the FACTS system.

The targeted implementation plan of FCAAS is to have the initial academic advising functions available to 75% of the Florida public post-secondary student population by January 3, 2000 when the system will be officially advertised. Other functional areas of the system are already available with links to informational sites that students may use in planning their educational future, but the main focus has been the advising area for the initial project rollout.

The implementation plan over the next three years involves expanding services to students and administrators for admissions, registration, financial aid, fee payments, career planning, distance learning services, and general student services such as online orientation. Once the infrastructure for communication between the institutions is established, there are unlimited possibilities for the exchange of information.

There is much enthusiasm for the FACTS project by the Florida legislature, the FCAAS Board, FCAAS, and the institutional participants. There is much work to be done at each institution for future functionality of the system, but we are on track to deliver an ever-expanding quality product for the state of Florida!

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Abstract

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ID Number:	EDU9918
Title:	New Markets for Meeting Old Needs: U.S. Distance Education and Developing Countries
Author:	Winthrop Carty
Organization:	LASPAU
Year:	1999
Abstract:	This paper analyzes the broad context and covers practical applications for delivering distance education in countries of the developing world. We begin by examining market trends in global higher education and continue by reviewing existing distance-education activity in developing countries. This is followed by a discussion of the conditions -- from the pedagogical to the technological-- under which U.S. universities can conduct international distance education in that part of the world. Finally, this report concludes with recommended strategies for engaging people and institutions on behalf of mutually beneficial distance education programs that target or include developing countries.

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New Markets for Meeting Old Needs: U.S. Distance Education and Developing Countries

EDUCAUSE 1999 Published Proceedings
October, 1999

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Abstract

This paper analyzes the broad context and covers practical applications for delivering distance education in countries of the developing world. We begin by examining market trends in global higher education and continue by reviewing existing distance-education activity in developing countries. This is followed by a discussion of the conditions -- from the pedagogical to the technological-- under which U.S. universities can conduct international distance education in that part of the world. Finally, this report concludes with recommended strategies for engaging people and institutions on behalf of mutually beneficial distance education programs that target or include developing countries.

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INTRODUCTION

Over the next two decades the developing world will face unprecedented demand for quality higher education. U.S. universities are in an unique position to help address these challenges and at the same time shore up enrollments and further internationalize their own institutions. In sum, we are now witnessing a convergence of interests between the U.S. university community and the educational needs of students in developing countries.

The conduit for this convergence of needs and interests is distance education.

This paper analyzes the broad context and covers practical applications for delivering distance education in countries of the developing world. We begin by examining market trends in global higher education and continue by reviewing distance-education activity in developing countries. This is followed by a discussion of the conditions -- from the pedagogical to the technological-- under which international distance education can be conducted in that part of the world. Finally, this report concludes with recommended strategies for engaging people and institutions on behalf of mutually beneficial distance education programs that target or include developing countries.

The paper is primarily directed at a U.S.-university audience. While many of the issues are fairly generic -- that is, they would resonate equally with the experiences of other industrialized-country universities operating in developing countries-- others are not. By concentrating on the United States' fairly unique higher education structure, curriculum, and approach to distance learning, I intend to lend the paper focus.

Conversely, while the paper focuses on the relationship of the United States to the "developing world", it often generalizes -- again for the purpose of focus-- the context and educational systems of developing countries. Generally accepted labels of "developing countries" actually encompass the very poor (such as most of sub-Saharan Africa), poor (such as much of Latin America) and middle-income nations (like Argentina). Also, cultural traditions drive several of the conditions one faces in implementing international distance education and, as we know, the world is a culturally diverse place.

In sum, this paper acknowledges that global distance education is, and must continue to be, a dynamic and heterogeneous system.

II. CONTEXT

Linking Quality Higher Education to Economic Development

Governments, private institutions, and families in many developing countries have longstanding traditions of turning to U.S. universities for training, technology transfer, and enhanced job opportunities. The Asian Tigers' industrialization was fueled in large part by its export of students abroad, including to the United States, as a means of rapid technology transfer. Today, despite the Asian economic crisis, Asians still represent 58% of the nearly half million foreign students hosted by U.S. universities. [1]

The Asian lesson has not been lost on the rest of the world: multi-lateral agencies, governments, and individuals alike view foreign training, especially in European and U.S. universities, as key to their future economic success. This link between education and development is becoming even more dramatic as understanding sinks in that the world has shifted to a new economic paradigm: the so-called global knowledge economy. In most of the developing world, globalization, economic liberalization, and the information revolution is forcing new skills requirements on previously protected labor markets.

Higher Education Population Explosion

The sheer number of students seeking meaningful university training will explode over the next twenty years. Under current systems and budgets, this need can't possibly be met, locally or abroad. Today, people in developing countries are disproportionately young (with about half of all people yet to reach adulthood). This disproportionate age distribution coincides with a second problem: recent investments and reform in basic education have dramatically improved the percentage of children enrolled in primary and secondary school in developing countries. This, in turn, will prompt a "domino effect" in education: a virtual explosion of demand for tertiary education by a higher-than-ever percentage of first-generation high-school graduates. In Latin America, for example, the rapid expansion in the number of new private universities (generally of poor quality) represents the initial symptoms of this phenomenon.

The vast majority of developing countries and their universities are completely unprepared to accommodate the growth in student numbers and increased expectations they bring regarding access to relevant, quality higher education. Public funding of higher education has stagnated and in most cases decreased, and the institutions themselves often suffer from brain drain, politicization, and excessive regulation and bureaucracy. Hence, today members of developing societies are looking abroad more than ever before.

Distance Education: Helping to Address the Quality versus Quantity Concern

Based on the discussion above, we can say that developing countries are faced with a "quality-versus-quantity" dilemma. If quality higher education is indispensable to survival in the globalized knowledge economy, how will they possibly be able to provide it:

a. where it doesn't now exist?
b. to vastly more people?
c. with roughly the same level of resources?

Regardless of the public sector's response, where do individuals turn to in the private sector -- which currently is absorbing the spillovers in demand, usually at the expense of quality-- for post-secondary education?

Answers to these questions will increasingly be sought through distance education emanating from or in partnership with industrialized-country universities. U.S. universities will invariably play a prominent role in this process.

The initial reasons distance education will be interpreted as a solution to the quality-versus-quantity dilemma are mostly economic:

1. **Technology becomes more accessible and more affordable.** As computer-processing speed-to-cost ratios continue to double every 18 months[2] and telecommunications costs plummet while bandwidth capabilities soar in similar ratio, it will become vastly cheaper and easier to reach geographically wide student audiences. This eventually will be true even in neglected regions with the arrival of wireless systems. For the first time in history, basic access to communications will not be a significant barrier and many will want to seize this opportunity.
2. **Economies of Scale.** The other motivating factor for choosing distance education is the economies of scale enabled by technology-driven distance education. According to this argument, many distance education delivery technologies can afford to have high fixed costs (such as course production costs or satellite transmission) and access to the best and brightest educators because they can spread these costs across vastly larger student populations. Hence, the per unit cost of education can then, in theory, be dramatically lowered through high student numbers -- precisely what developing countries will have in abundance.

To summarize, distance education will increasingly be viewed as the means to provide *more people* with *better education* using the same resources. The jury is still out on whether this argument will hold up over time, but U.S. universities will nonetheless have ample opportunity to participate in efforts to ensure it does.

Review of Current Activity

A survey of distance education in developing countries reveals a rich diversity of activity over many years -- within single countries, across regions, between continents. Predating the current technological revolution, the UK Open University is perhaps the best known of the "mega universities", having granted over a quarter million degrees since 1971. The UK Open University is a good example of university training based in the industrialized world that increasingly reaches out to students in developing countries. The university has also been remarkable in its success in reengineering its traditional print-based open learning system to one also encompassing the full spectrum of delivery media while also adapting the mix to meet local demands on a global scale. In 1996, UKOU established Open University Worldwide (OUWO). Current overseas enrollments exceed 20,000, and this number is growing.[3] Many of the traditional mega universities are based in developing countries. For example, China TV University currently graduates over 40,000 students in technology fields. The chart, Mega Universities around the Word" (Table 1 in Appendices) illustrates the reach traditional "mega universities" have enjoyed in the developing world.

Under the new technology paradigm, however, new players have emerged. Two merit special attention for their adoption of new technologies and for having accessed U.S. higher education resources: The African Virtual University, funded by the World Bank, and implemented in collaboration with local universities, is an example of what the public sector can accomplish in sub-Saharan Africa, perhaps the world's most improbable venue for technology-based regional distance education. Monterrey Institute of Technology (ITESM) is illustrative of success achieved through reaching out to the private student market across Spanish-speaking Latin America.

Exemplar 1: African Virtual University

The World-Bank sponsored African Virtual University (AVU) was created to provide large-scale, quality tertiary education in science and technology fields in sub-Saharan Africa where, according to AVU, "the investment cost is the highest and the human resource base is the weakest."

Through partnerships with 14 English- and eight French-speaking universities in 16 countries, AVU aims to augment and supplement local offerings with world-class teaching and research support from industrialized-country universities, including from the United States. Currently into its first full pilot year of operation, AVU has already taught over 9,000 students using interactive satellite instruction supported by online bibliographic resources. The next phase contemplated for the project involves adding online courses to the mix of foreign-source satellite and traditional classroom offerings.

As partner-institution participation increases, the institutions themselves are able to share in the cost-reductions achieved by the improving economies of scale -- a strong incentive for inter-institutional collaboration toward shared academic and socio-economic goals.

For more information about the African Virtual University, visit their website at: http://www.avu.org

Exemplar 2: ITESM

The "Monterrey Tech System" is one of Latin America's top universities and, with over 60,000 students, the largest private institution in Latin America.

ITESM initiated its Virtual University ten years ago, well ahead of the fashion, and hasn't stopped innovating since. The university, based in Monterrey, Mexico, now delivers courses via traditional and distance methods to its 28 regional campuses throughout Mexico and, more recently, has expanded to nine other countries in the Region. The Virtual University's delivery mix includes one-way satellite fortified by realtime Internet-based communications between faculty and remote classrooms, as well as asynchronous interactions through the web between students and faculty, and students and learning materials. Currently, ITESM's Virtual University has 1,429 receiving sites distributed throughout Mexico (1,302) and Spanish-speaking Latin America (127).

Monterrey Tech's Virtual University currently offers 15 different degree programs in business administration, engineering, technology, and education. The V.U. is also expanding into non-degree in-service basic education training programs, which have already trained 750 public school principals in Panama and 5,300 teachers in seven countries across the region.

Monterrey Tech has leveraged its academic quality and expanding distance-education student populations to achieve substantive partnerships with several North American universities. ITESM and the Arizona-based Thunderbird School of International Management currently have 129 Latin American students enrolled in a joint MBA program, the first joint degree between a Mexican and a U.S. university. Students, currently located in Perú and throughout Mexico, are taught via one-way satellite and the web with instruction originating from faculty in both Arizona and Monterrey. ITESM also offers a joint certificate program in educational technology with a Canadian university, the University of British Columbia (U.B.C.), and has collaborated in team teaching, guest-lecture, and other endeavors with a number of U.S. universities, among them Carnegie Mellon, Harvard, and UT-Austin.

For more information about ITESM, visit: http://www.itesm.mx

III. CONDITIONS FOR DELIVERING DISTANCE EDUCATION IN DEVELOPING COUNTRIES

The previous sections attempt to establish that both the market and justification for globalized distance education directed at developing countries have emerged and will increase substantially over the next two decades. Nevertheless, U.S. universities engaged in delivering distance education programs first must understand the conditions -- social, economic, technological, and educational-- prevalent in much of the developing world. The remainder of this paper will endeavor to analyze these conditions -- many of them posing considerable challenge-- and concludes with strategies for managing them.

In many developing countries, the poor quality of telecommunications infrastructure, low per capita computer ownership, limited technology and information literacy, and restricted numbers of networked institutions together conspire to smother access to the types of online education coming out of the United States and elsewhere. Furthermore, disparities in *fundamental* expectations about what makes up education and what it should cost often need to be surmounted as does, for degree-seeking students, local recognition of degrees.

Some of the "cons" of bridging U.S. and developing-country systems can be interpreted as an exacerbated version of the same issues of access and equity found in the industrialized countries. (For example, a 1999 report by the U.S. Government, "Falling Through the Net: Defining the Digital Divide," pinpoints, in a U.S. context, many of the same concerns discussed in this paper.) However, other issues are unique to individual regions, cultures, or the developing world as a whole.

We will begin with the aspects generally most overlooked -- the human concerns-- and move on from there to the technology and institutional arenas.

Academic Arena

Globalized distance education presents a *huge* challenge: how to bring together highly heterogeneous student populations under one academic roof. Until now, one traveled to Rome and "did as the Romans did." Now, however, where's Rome?

1. **Pedagogy and communication:** Bridging differing approaches to learning and communications is an enormous task. In much of the developing world, rote learning is even more entrenched than it (still) is in the United States. Many developing-country educational systems have highly vertical structures. In Latin America, for example, education is one of the last bastions of traditional authoritarianism in which information is dictated, literally, to students by professors with little interaction, autonomous research or writing. These patterns have engendered strong resistance to the new learning styles promoted by the more horizontal, student-centered approaches emerging in distance education.

2. **Curriculum:** U.S. universities, especially at the undergraduate level, offer a considerable amount of freedom of choice and breadth of subject matter through electives, general education, electing or changing majors downstream, adding minors, and so forth. In many countries, coursework outside of one's "career" is viewed as near heresy. One can imagine, then, the skepticism encountered with U.S. exports and the unbundling and rebundling of course offerings that technology now evokes. This disparity is a challenge well beyond the mere mechanics of assembling degree programs and extends to people's core definition of education.

3. **Faculty:** The highly ambivalent reaction of faculty to the new paradigm being rendered by technology is universal. Early-adopter enthusiasm and experimentation, countered by others who are skeptical and resistant, is found everywhere these new systems are introduced. However, it is safe to say that, overall, in developing-country universities, given much lower technology penetration the extremes are more marked, with more people in the ambivalent or unknowing middle, yet to be impacted by the change. On the one hand, enthusiasm among some is intensified by the huge benefit teachers and researchers in poor countries perceive, correctly, in discovering new international colleagues and vastly more up-to-date research. In other words, the improvement to their professional lives through connectivity is far greater in relative terms than to, say, a professor at Columbia University in New York who already had access to state-of-the-art teaching and libraries along with international networks of colleagues. The backlash, or often just passive resistance, is also more entrenched in most developing-country universities. A very high proportion of faculty in much of the developing world has failed to become technology and information literate, and many of these people interpret sudden access by colleagues and students to represent, correctly, a threat to their monopoly on a limited amount of outdated information.

4. **Students:** Generally, one encounters larger portions of university students with little or no level of "technology literacy" (defined here as ability to use Information Tecnology and to learn, with comparative ease, new software and systems). In practical terms, this translates into far steeper

learning curves in some countries and institutions than in others when introducing technology-based distance education programming. Socio-economic backgrounds are an important determinant, with members of local elites generally as conformable with technology as mainstream U.S. students, while the non-elite majorities can be completely unfamiliar with computers. Perhaps more important are disparities in "information literacy"[4] -- in which information is collected, usually through computer networks, then, through active collaboration with others, used to construct new understanding. A generation of U.S. (and other industrialized-country) university students already have become semi- or fully "information literate" while most developing-country university students are still struggling with basic technology literacy. Many believe this disparity is growing, which has significant implications for both the practical aspect of global distance education (i.e., functioning under one "academic roof") as well as for the overall socio-economic issues.

5. **Materials:** Much is made, correctly, about the burgeoning availability of resources online. However, books and hardcopy journals and other bibliographic materials are still important even in many distance education programs. Ready local access to these materials cannot be assumed and their distribution around the globe is no trivial task. Even if no hardcopy materials are needed for a program or their distribution is addressed from a logistical standpoint, students in many countries with severe shortfalls in libraries and bookstores are at a distinct disadvantage when it comes to supplemental reading and research.

6. **Accreditation and assessment issues**: In historical terms, this can of worms has only just been opened and it promises to be very complicated. Accreditation bodies throughout the world, whether they be education ministries or, in the United States, private agencies, are becoming overwhelmed. New standards of measurements are only beginning to be developed in the United States for programs devoid of the bricks-and-mortar campus. The emergence of digital diploma mills, using the aura of technology to peddle their wares, poses a significant problem to the majority of quality-conscious efforts. Developing countries, often with legacies of highly credentialistic civil service systems left behind by colonial powers, are especially vulnerable to promises of quick "American degrees" for public-sector jobs. These activities are often marketed unscrupulously in developing countries. Unfortunately, this phenomenon has fueled the skepticism over the increased flexibility, dynamism, and access distance education *can* provide people who need it. It is important, therefore, for U.S. universities to portray -- more than they would need to locally-- their accreditation credentials and assessment processes.

Cultural Arena

The diversity rendered by international distance education adds a new and extremely valuable dimension to the learning experience. Students in multi-point distance education programs typically highlight cross-cultural interaction as one of the best features of the experience. Bridging cultures is also a big challenge. As mentioned earlier, communication patterns, values regarding one's elders, and the social status of "the professor" can vary widely. For example, in their study of international distance education, Michigan State researchers Inkyung Lee and Joonho Do note that different oral communication styles between Koreans and Americans represent a significant challenge to ensuring student motivation and averting misunderstanding between faculty and student groups. Asynchronous technologies have been found to be an excellent "equalizer" across differing communication styles and language proficiency levels. Students who are shy or less proficient in the language of instruction than other, possibly native, speakers, have time to compose, double check, and prepare their contribution. On the other hand, other cultures, such as many of those in Latin America, emphasize oral communication more greatly and give less credence to written communications than to face-to-face interchange, making heavy reliance on asynchronous communications a possible barrier to positive learning outcomes.

Technology Arena

In discussions about distance education in the developing world, the technology issues typically grab the spotlight. There are huge disparities in access to computing and communication resources as the table, "Global Disparities in Telecommunications and Computing," located under Table 2 in Appendices, starkly indicates.

These "information gaps" are especially dramatic in some regions of the developing world, such as sub-Saharan Africa and in virtually all rural and provincial areas. In addition, even where access to adequate telecommunications exists on paper, their cost or the delays in installing them can be severe impediments. Currently, for example, the high rates of local telephone connections in Buenos Aires make lengthy browsing or videoclip viewing through a local Internet service provider, taken for granted in the U.S., a costly activity. Few institutions are properly networked, hardware is often old, and typically there is a paucity of trained technical support to keep systems running.

Thus, as a rule, bandwidth, and access to local and wide area networks is a scarcer and sometimes non-existent commodity, a factor that must be taken into account in determining the mix of delivery technologies. Historically, distance education efforts have taken to the airwaves to circumvent these problems and, indeed, as the cases of ITESM and African Virtual University illustrate, they continue to do so.

Two factors will help offset these "technology barriers," which is why I believe more attention should be paid to the human, cultural, and educational concerns than to the purely technological problems:

1. **The exponential rate of improvement to the ratio of cost to computing speed is quickly lowering the threshold for participation by poorer countries in technology-based education.** This will not apply to the speed of penetration of the newest technologies, which will continue to "trickle down." However, dropping thresholds to entry help speed up attaining the critical masses of connected people and institutions needed to justify distance education.
2. **The wireless revolution, now in its incipient stages, will circumvent the traditional barriers to telecommunications connectivity.** This impact will be especially dramatic in the poorest and most rural areas.

In sum, devices will be able to be connected to each other and to the outside world more efficiently and at costs that will eventually drop to realistic per capita spending levels in the developing world. It is important to note, however, that shifting these resources to these new venues from often wasteful and entrenched education bureaucracies is another -- non-technology-- matter.

Political and Economic Arena

Unstable politics, volatile economies, and weak institutions have plagued developing societies throughout most of their histories. Collaborative international distance education, with its need for planning across systems and over time, is especially vulnerable to these elements. For example, when the value of the Brazilian *real* collapses relative to the U.S. dollar, tuition costs for U.S. university programs skyrocket. While rich Brazilians can absorb this increase, the larger and more fragile middle class often cannot and drops out. In another scenario, a change in government in a country with a "winner-takes-all" approach to public office could result in a radical shift in accreditation of distance education degrees or a rescinding, perhaps whimsically, of a joint program arranged with the support of the previous Education Ministry.

These problems are indeed real and need to be factored into one's "risk analysis" when engaging in new activities in new countries. The best advice is to start gradually, build on existing relationships, ensure working with local partner institutions, and stay on top of ongoing political trends. On the positive side, the numbers of stakeholders in distance education will invariably grow among members of local governments, institutions, and civil society, which should lend greater stability and predictability to the endeavor.

Funding of higher education and local attitudes toward the perceived cost of education is another factor. In many places, university education, in stark contrast to U.S. attitudes, is expected to be "free," as real costs are absorbed through state subsidy. Private universities have stepped in, often with low tuition levels and commensurately low academic quality, further fueling the notion that, somehow, "education is cheap." In this context, the disparities between U.S. tuition levels and those in many countries can be huge. And even when many private citizens can afford to pay these tuitions, they perceive the costs as exorbitant, especially if the education is delivered through poorly understood systems and methodology. This disparity in expectations may change over time as higher education reform in many countries attempts to address more transparent funding systems and issues of academic quality. Also, many believe that U.S. higher education is economically inefficient and over-costly and will invariably be brought to its budgetary knees through competition from the new academic interlopers (many of whom are in distance education).

IV. STRATEGIES

We have just reviewed the conditions for delivering distance education in developing countries. The following set of strategic issues includes general recommendations for how to navigate through these conditions, if and when they in fact exist.

Strategic Issue 1: Modalities

How will your university work in specific countries or regions?

- **Build on existing international partnerships wherever possible. If the local capacity exists in terms of technology and change, tried and true relationships, which already enjoy trust and personal connections, are the best option.**
- **Seek out new local partner institutions. Invest time to start gradually.**
- **Grants, public programs: Increasingly, multi-lateral organizations (such as the World Bank) are funding distance education initiatives. Local, in-country partners are usually a pre-requisite for funding.**
- **Direct private enrollment. The online degree model circumvents the need for local partners. Marketing is a big challenge.**

Strategic Issue 2: Academic Concerns

How do you ensure accreditation and explicit standards?

- **Academic program accreditation is fundamental and must be made explicit for credibility.**
- **Student admissions and enrollment systems need to adapt to local context while clearly upholding international quality standards.**
- **Student evaluation and grading systems must be consistent across groups; ensure control for fraud and abuse (surrogate test-takers, etc.).**

Strategic Issue 3: Pedagogical Concerns

How to reconcile assessment processes, and teaching and learning styles?

- **Invest in coordination, planning, and, especially, training local faculty and staff.**
- **Ensure more-than-adequate training and support for students to ensure high comfort levels.**
- **Evaluate, *a priori*, different learning traditions and approaches and have a clear pedagogical strategy for reconciling differences among heterogeneous groups.**
- **Ensure no significant disparities in access to learning materials, or structure coursework to ameliorate them.**

Strategic Issue 4: Technologies

Which delivery media mix? How to predict changes in local access or capacity relative to the United States?

- **Scale communications and software to shared levels. Ensure no student group is excluded by the choice of technology.**
- **Invest in developing local, in-house capacity to support and train in new and upcoming technologies.**
- **Be especially flexible in your mix of media. Build into course design the ability to substitute one system with another in event of failures or miscalculations of local capacity (for example, sending video cassettes en lieu of videostreaming).**

Most strategy options share a common philosophy: be flexible, respect local ways of conducting education, seek an appropriate middle ground where fundamental differences exist, and work to ensure the flow of learning is two-way; simply exporting the "American way" is neither sustainable nor appropriate. These strategies have little to do with modern technology and, instead, represent traditional common sense.

V. CONCLUSION

The paper argues that we have arrived at a convergence of interests between the U.S. university community and the educational needs of students in developing countries: international distance education will increasingly be a means for U.S. universities to expand their reach, while potentially millions of students, previously locked out of the quality higher education arena, will now be able to enter. First, however, many complex and changing challenges need to be tackled, ranging from rationalizing highly heterogeneous educational systems and socio-economic levels, to bridging disparities in technology. But, as we know from the exemplars of ITESM and AVU, these challenges can be surmounted. Furthermore, despite the gaping "technology gaps" between rich and poor, the price for accessing the technologies will reach negligible levels and the impending wireless revolution will obviate the need for depending on governments for costly infrastructure to connect.

Ultimately, each U.S. university needs to provide its own answer to why it would choose to engage in distance education in developing countries. The paper provides one reason, which should be common to all institutions: the student market exists and will grow.

However, there are other reasons of greater transcendence to most U.S. universities, public and private. First, by engaging themselves in distance higher education in the developing world, U.S. universities will be themselves better equipped for the globalized future; as the global economy becomes more interdependent, so will higher education. Are U.S. universities prepared for this interdependence? Already, in response to this challenge, many U.S. universities are making explicit efforts to further "internationalize" their campuses. What better way to internationalize than through team-taught classes with multiple sites around the globe engaging student teams across time, distance, culture, and perhaps even language?

A final, though no less important reason, is the contribution U.S. higher education can make to global society. We are at the beginning stages of the Information Revolution and can only speculate what the world's landscape will look like once the dust settles. U.S. universities have an opportunity to influence the outcome. They also face the risk of being left behind.

APPENDICES

Table 1: Mega Universities around the World

Mega Universities Around the World

Institution	Began	Students	Budget (US$-M)	Unit Cost
Anadolu University, Turkey	1982	**578,000**	30	**10%**
China TV University	1979	**530,000**	1	**40%**
Universitas Terbuka, Indonesia	1984	**353,000**	21	**15%**
Indira Gandhi National Open University, India	1985	**242,000**	10	**35%**
Sukhothai Thammathirat Open University, Thailand	1978	**217,000**	46	**30**
Korean National Open University	1982	**211,000**	79	**5%***
National Center for Distance Learning, France	1939	**185,000**	56	**50%**
The Open University, Britain	1969	**157,000**	300	**50%**
University of South Africa	1873	**130,000**	128	**50%**
Payame Noor University, Iran	1987	**117,000**	13	**25%**
National Center for Distance Learning, Spain	1972	**110,000**	129	**40%**

**Cost per student as a percentage of average for other universities in Korea*

Data Source: John Daniel, Mega-Universities and Knowledge Media.

Also published in Science magazine July 18, 1997

Table 2: Global Disparities in Telecommunications and Computing

Global Disparities in Telecommunications and Computing

Country Classification	Telephone Main Lines per 1,000 - 1996	Personal Computers per 1,000 - 1996	Internet Hosts* per 10,000 July 1997
Low Income	11	**not available**	0.06
Middle Income	78	12.1	2.38
High Income	540	224	203.46
World	133	50	34.75

* Internet Host is a computer (server) permanently connected to the Internet and serves as a rough measure of overall connectivity

Data Source: World Development Report, World Bank, 1998/99

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ENDNOTES

1 Source: Institute of International Education, "Open Doors" 1997/98.

2 Known commonly as "Moore's Law", every 18 months the same processing power costs half as much and, inversely, twice as much processing speed can be purchased for the same amount of money. Over time, this rate of improvement is exponential.

3 "Globalising Education: Trends and Applications," by Robin Mason of Open University, provides insights into UKOU's global experiences along with in-depth coverage of many of the issues discussed in this paper.

4 See Taizo Nishimuro's case for a fundamental difference between computer literacy and information literacy, in "Information Literacy: How does it differ from Traditional or Computer Literacy?" at http://www.TechKnowLogia.org

EDUCAUSE *Information Resources Library*

Transforming Education Through Information Technologies

Abstract

Category: Papers Presented at EDUCAUSE annual conferences

ID Number:	EDU9924
Title:	PBS Develops Institution-Neutral Online Services for Non-Traditional Adult Learners
Author:	Christopher Reese
Organization:	Public Broadcasting Service
Year:	1999
Abstract:	As the IMS interoperability standards roll closer to widespread usability, the Public Broadcasting Service and the U.S. Department of Labor has formed an articulated partnership to development a Web-based project. This interactive project places institution-neutral student services for non-traditional, distance learners on the Web. With seven areas of services, users can seek out educational materials and customize a learning agenda to lead them into a chosen career path or occupational field. PBS and DOL are collaborating on a career management account to help users hold their electronic information and learning agenda in a lifelong learning portfolio.

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PBS develops institution-neutral online services for non-traditional adult learners.

Christopher Reese
Public Broadcasting Service, Adult Learning Service
Alexandria Virginia

As the IMS interoperability standards roll closer to widespread usability, the Public Broadcasting Service and the U.S. Department of Labor has formed an articulated partnership to development a Web-based project. This interactive project places institution-neutral student services for non-traditional, distance learners on the Web. With seven areas of services, users can seek out educational materials and customize a learning agenda to lead them into a chosen career path or occupational field. PBS and DOL are collaborating on a career management account to help users hold their electronic information and learning agenda in a lifelong learning portfolio.

Introduction

With the popularity of cable and satellite dish program delivery, the general American viewing audience has many more options for receiving distance education courses. With a simple phone line, Americans can get connected to the Internet and have access to a variety of online courses. Today's educational institutions and many independent education producers are developing online courses to attract more students.

There are a number of innovators working on the Web today. Many more are following the trends of the market and the advancements of technology. Unfortunately, many are not forging ahead in new areas and sticking with the traditional methods of instruction. The largest fear going through the hearts of colleges and universities is two-fold. Faculty members fear that their administration will force distance education on them to increase enrollments and revenue, whereby the workload increases for the faculty. Secondly, the administration hesitates to advertise the costs and benefits of their distance education programs for fear that learners will choose "the cheaper alternative" instead of the better courses to receive their degree.

What is the truth about distance education? When presented with a choice, will students simply choose the less expensive alternative, regardless of quality? In search of tuition dollars, will a college administration force faculty members to offer courses at a distance? Certainly there are truths that lie within these statements. However, if you look at the impact for the students in today's environment of non-traditional family structures, it is often the parents and children who attend classes. These parents have multiple jobs and other increased pressures for the home and workplace. As their lives are become crowded, the hope of going back to school and receiving a degree becomes increasingly unlikely. With the use of technology and the Internet-based courses, the chances of working towards a degree are not only more likely, but more valuable as well.

The Anyone, Anytime, Anywhere Philosophy

The system of distance education has provided greater access to education materials to a wider audience. However, distance education still remains unattainable for many people. Three main points must be addressed by any institution that wants to offer courses and material at a distance.

1. any person may enroll in courses without regard to prior experience or education
2. open enrollment means that a student can begin and complete a course without time restrictions
3. course work and study is done anywhere the student chooses

Available to anyone?

In the current higher education system, a college or university will gladly enroll a student in a course or curriculum, but rarely assists the student in assessing the goals and capabilities of that student. Placement tests are taken and academic advisors are assigned, but do they assess experiential learning or learning styles? When a student is finishing a degree, is there assistance in transitioning to the workplace? Will a school assist a student who is less than full-time or who has attained a certain number of credits?

No doubt some schools are addressing the needs of the students with partnerships in the community and other organizations like ACT and the Council for Adult and Experiential Learning (CAEL). Unfortunately these services rarely function for the non-traditional students who do not belong to that institution full-time.

What happens when the non-traditional learners attend multiple schools? What about the adult student returning to finish a degree? Or the individual wanting some professional development instruction? How accommodating are schools to people with disabilities and special needs? Will they find a school that will offer a degree to a person who has created an educational agenda that may involve other schools?

When can I get it?

The terms "just-in-time" and "on-demand" training are well-known terms in the business world, but in the higher education realm this is not often the case. Higher education institutions often run how they have traditionally done so for centuries. With today's technology the walls of a campus could be expanded to encompass the country, if not the world. But when could you get and education?

The traditional academic terms are divided into semesters or quarters. Enrollment in classes generally begins several months prior to the term and closes when the class starts. The reason behind such a system is simple: it provides a method of counting the number of students registered, collecting the tuition dollars and fees, and assigning faculty and assistants to the course. Like the ocean tides, there is an ebb and flow to the standard academic calendar.

Altering or breaking this enrollment process is impossible for many institutions not fully supporting the "anyone, anytime, anywhere" philosophy. However, some institutions are providing "open enrollment" options to accommodate the diverse needs of the students. Open enrollment means that a student can register and begin a course at any time. The significance of this policy is obvious: when a person needs training they can register and receive it. Of course, an institution must be equipped to deal with multiple enrollment periods and the assignment of faculty to cover such courses.

Where can I find an education?

The location of educational materials was important in a traditional campus setting. For books you visit a library. For instruction you attend a lecture hall. For more extensive research you may delve into the archives of several school libraries. Even a continuing education program requires participants to belong to the local community. In an online and interactive format, there are electronic texts, discussion forums, listservs, bulletin boards, simulations, equations, research journals and a plethora of other services. Logically, no reason exists why learners without physical ties to a particular institution or community cannot utilize distance learning resources. Learners will continue to build their own communities and redefine their relationships, both personal and professional, with the technology available and the creativity of their own devices.

Why use IMS standards?

The Instructional Management System (IMS), an initiative of EDUCAUSE (originally EDUCOM), currently is developing a set of standards to identify instructional materials in a Web-based environment. Comprised of an investment board and a technical board, the IMS Project (www.imsproject.org) promotes the interoperability between institutions and the instructional materials that faculty members will increasingly use in their classrooms, whether in-person or virtually.

The impact for Project ACCESS resides in the suites and the portfolio system. With a set of approved standards, the information that resides in a portfolio could be shared between the student and organizations that the student would share his information. As part of a research project or of graduate studies, a student's work could be tagged with IMS metadata and stored online for other people to research and study.

As Project ACCESS evolves over time, the expansion of the suites and portfolio could grow to include new educational features that technology and the Internet provides. Using metadata to identify the features will increase the interoperability of products and services provided by businesses, non-profit organizations, educational institutions and a wealth of new entrepreneurial endeavors. The more interoperable products become the more resources that are available to faculty and trainers, meanwhile reducing the technical problems attached to the current crop of online educational materials.

What is PBS doing?

PBS received a FIPSE grant (Fund for the Improvement in Postsecondary Education) last year from the U.S. Department of Education to develop Project ACCESS. This project is designed as an interactive, Web-based student decision-making and advising system that gives students information about educational opportunities for completing degrees, advancing careers, and expanding horizons.

Based on an initial three years of funding, PBS Project ACCESS involves an advisory board and six pilot institutions to ensure that the development addresses the needs of the non-traditional adult learners. The development team is creating an online environment that can either guide a user through seven suites of services or allow full range to choose what services are most important. The seven suites of Project ACCESS are:

1. *Suite One: Career Goals, Credential Requirements and Learning Agenda*

   This section of Project ACCESS will lead the user through a series of self-assessment exercises to clarify his or her long-term vocational goals and aspirations. This leads to an analysis of the credentials that the user will need to move successfully along this career path. Once gaining clarity and realism about the credential requirements ahead, the user is directed through a process to construct an Individual

Development Plan (IDP) that leads to acquiring the appropriate credentials and certifications. The IDP, articulated in terms of competencies, will become a map and an evolving planning tool as the student progresses through his education.

2. *Review and Analysis of Prior Academic Attainment*

Many adult learners have pieces of academic learning, but they often do not know how these pieces fit into a degree program. Project ACCESS will enable users to assemble transcripts and records and create a personalized Career Management Account (CMA). Each CMA contains a secure and confidential Lifelong Learning Portfolio (LLP). Each portfolio will have three levels of documentation: (1) working records and self-reported information (i.e. resume); (2) semi-official documentation, including copies of transcripts and credit-relevant indicators of learning, and finally (3) verified documentation of completed courses, degrees, and certifications.

In many cases, the institutions, not the students, hold this information. Most adult students do not have a clear picture of their academic credit history or its "conversion value" into the next stage of academic degree programs. Project ACCESS would allow the user to analyze not just courses and credits, but also specific competencies and skill areas to acquire by taking credit courses that count toward a degree or certificate. This advising process will guide the user to assemble the relevant elements, understand the issues, and gain a total picture of their status in the higher education system.

3. *Credit for Experiential Learning*

This advising module will explain the various options for earning academic credit for experiential learning and enable the user to use one or several methods of gaining credit. In addition to Project ACCESS' Lifelong Learning Portfolio, this module would contain a tutorial for developing a physical portfolio in which a student may present a written case for having already learned in non-formal settings what is taught in undergraduate courses.

National examination programs such as CLEP, DANTES, and the Regents exams will also be featured in this advising space. Providers will be invited to include explanatory samples of their exams in digital form and allow the user to do a practice sample of several tests. Links will be included to appropriate Web sites throughout.

ACE/CREDIT (formerly PONSI) will also be invited to include the Project ACCESS process in their information about non-collegiate sponsored instruction. The employers who participate in ACE tend to promote education and credit-toward degrees for their employees, and thus would be likely users of the Project ACCESS advising process. In return, employers would have an opportunity to recruit successful users in the job transition section of Project ACCESS and the partnership with America's Learning eXchange.

4. *Learning Styles and Distance Education*

So a learner can gain a total picture of him or herself as a learner, this module of ACCESS will guide the user through an inventory of questions that reveal his or her strengths and weaknesses as a learner. This inventory may include the Learning Style Inventory administered by the TRG Hay/McBer Training Resources Group. The Myers Briggs will be another resource. Use of these inventories is supported by David Kolb's research on learning style types among adults and these inventories are commonly used by CAEL in their regional training workshops. Sample portions of these proprietary instruments may be free to the ACCESS user, but full use of the instruments could be taken online for a fee.

5. *An In-Person Advising Option*

Although Project ACCESS offers many free, interactive routines designed into the software, the process is self-paced and can be done in any order depending on the preferences of the user. Many cues, help items and instructional tips will be programmed to assist the users throughout. However, we understand that many people may wish to interact with a live, qualified advisor at some point in the process.

Interaction with a real person advisor is likely to be more effective after a prospective student has gone through a methodical document assembly and self-discovery process afforded by the ACCESS software. Thus once a user has begun to assemble the CMA he can opt, for a fee, interact with a trained advisor via email, telephone, Web-based threaded discussion, and possibly through See-U-See-Me technology for face-to-face contact if available to the user. Project ACCESS has invited the American College Advisory Service (ACAS) to collaborate in developing this feature of the service. Dr. Jacqueline Johnson will serve as the principle liaison for this purpose. This 7X24 service will be ready for use under pilot basis in the third year of the project.

6. *Selecting and Enrolling in a Distance Learning Program*

The user of Project ACCESS will be able to move freely throughout the four general advising areas through SERF's intuitive and attractive graphic interface. Having become both more self-aware and familiar with the rules of credit in American higher education, the user will have clear criteria to evaluate academic programs for further study. This suite will contain search procedures and tactics to find programs and evaluate their appropriateness.

Project ACCESS will invite distance learning programs to apply to be listed and described in the software along standard criteria. A panel of experts in the field of distance education selected by the Advisory Group will review these applications in the second year of the grant to determine which programs meet a basic set of criteria. Institutions listed directly in Project ACCESS would pay an annual subscription fee to PBS, which will use the funds to maintain and update the service. In addition, hot links will be provided to other Web sites and search services outside ACCESS that relate to distance education.

Users of Project ACCESS will have clear ideas of what they want in a program and how to assess if a program has those features. Project ACCESS will also link where appropriate, to on-line admissions and registration at participating colleges. The user can draw upon any information in his or her Lifelong Learning Portfolio to transfer to the institution as part of the application process.

Although the main target population for ACCESS will be adults in the United States, we are aware that distance education by definition is international. We anticipate a growing number of non-Americans based overseas being interested to access distance learning options in the United States. This exploration will only begin in the third year of the grant period.

7. *Continuous Advising, Evaluation, and Transitions to the Workplace*

Designed to serve the student throughout an educational program and beyond, this suite assumes the major work of the decision-making support service will be completed. The client will have the option to contact a Project ACCESS in-person advisor at any time after the first use. Users will be asked to provide on-going evaluation of the Project ACCESS advising service itself, whether immediately after choice, or later into the program. Project ACCESS will contain a time management planner for distance learners that may be useful during the program. Another option will allow a student to project a final GPA based on different assumptions of grade performance in one's coursework.

Users of Project ACCESS will retain access to their CMA and can update them as they progress. In a sense, the final sector of Project ACCESS will return to the beginning where the user defined career goals and credential needs. Project ACCESS will not have a systematic job search and preparation unit. However in an agreement with the Department of Labor's America's Career Kit (ACK), the career information within Project ACCESS will directly reflect the occupational codes, skills taxonomy and employment opportunities using the ACK coding. Thus Project ACCESS will contain a job search capability with links to America's Career Infonet (www.acinet.org), America's Learning Exchange (www.alx.org), Job Bank (www.ajb.org) and Talent Bank (http://atb.mesc.state.mi.us/), and the PBS Ready to Earn® site (www.pbs.org/als/rte).

Why is PBS doing this?

Many institutions currently offering distance education programs assume that students are local/regional constituents who will access pertinent institutional information and student services through the conventional campus-based systems. Similarly, many institutions have established state and regional articulation agreements and transfer policies. In brief, student information and services are still primarily institution-centered and geography-based.

However, as the geographic, political, and service area boundaries once characteristic of higher education expand and become increasingly less relevant, colleges face a challenge to providing student information and services through methods that are time- and place-independent and transcend geographic, political, and service area boundaries. This challenge, which surfaced in the national PBS Going the Distance initiative, was also identified in "The Virtual University: A Report from a Joint Educom/IBM Roundtable" (Twigg & Oblinger, 1996):

> The increasing power of the consumer in addition to technology's ability to transcend space, time, and political boundaries is causing a shift in the decision-making process away from public policy and toward market-driven mechanisms. Content and mode of delivery are increasingly defined by external groups: students as well as employers. Communications technologies will contribute to both the increase in the number of providers and the choices for consumers, resulting in a more open higher education marketplace (13). ...(and) New developments in technologies and the explosive growth of networks will continue to erode the geographic hegemony of higher education. Students will be likely to select educational institutions based more on offerings, convenience, and price than on geography. This competition will not be limited to the United States or North America; it will be global (6).

Coordinating with other initiatives

Once PBS had received the FIPSE grant, the development team met up with the staff of the America's Learning eXchange from the U.S. Department of Labor. It was discovered that this ALX project was placing an interactive tool on the Web so that a user could place resumes online and search over one million jobs posted from across the United States. Along side the job search, assessment tools and "virtual counseling" options would be available to better identify a person's potential career paths and employability in different occupations.

With the rollout of the larger DOL project, the America's Career Kit (ACK), Project ACCESS will integrate its underlying database structure with the occupational codes of ACK and offer distance education and training opportunities for people either entering the workforce, looking to change careers or simply enhancing their current strengths. Furthermore, as traditional students begin college, they can be looking for similar educational experiences through Project ACCESS and increase their employability in the national job market. As the Web becomes more populated with employers posting job descriptions and employees posting resumes, the need emerged to have a single source of federally and state standards that everyone can refer to and understand.

Project ACCESS recognizes that there are existing initiatives such as the Education Network of Maine (ENM) and new organizations such as the Western Governors University (WGU) and the SREB Electronic Common Market. These and others are emerging as brokers for consumers, helping consumers understand the choices; however, these initiatives still reflect political boundaries or regional boundaries and exist as organizational entities with a central administration. At times, these existing models tend to still be territorial and somewhat regionally competitive, or exclusive. Project ACCESS, on the other hand, proposes an open and participatory system with aspirations of being national in scope and possibly global in its ultimate reach.

Project ACCESS will also build upon the FIPSE-funded ABELINC Project lead by Governors State University and 15 community colleges around the nation. Five of these colleges will join with GSU in providing the institutional settings for both Alpha and Beta tests, and for guiding Project ACCESS from the perspectives of in-the-trenches advising professionals who specialize in helping distance learners. ABELINC is a national 2+2 articulation program for distance learners who are successful at the Associates level and wish to proceed to the bachelor's degree using these study skills. GSU and its community college partners, many of whom are leaders in the national GTD network, have worked closely with PBS on distance learning initiatives over many years. The need for an online advising service such as ACCESS, and the basic idea for PBS to facilitate and host it, emerged from the collaboration among practitioners in the GTD and ABELINC projects.

Mary's Story: A case study of a non-traditional adult learner

PBS Project ACCESS would address these information gaps and help students fulfill their educational goals. The need for the proposed ACCESS project can be conveyed best through a scenario about the typical distance learner and the dilemma of choice in a market-driven, information-rich learning society.

> Mary is about to complete her A.A. degree, at a community college that participates in the PBS Going the Distance degree project. She has completed the majority of her coursework through telecourses and the efficient use of distance learning and other instructional technologies. Long ago she invested in a VCR to have greater flexibility in recording off-air programs to view her telecourses. Within the last year, she invested in a multimedia PC and connected to an Internet Service Provider (ISP) to take advantage of telecommuting opportunities at work, as well as telelearning through online courses offered by the community college.
>
> Mary is now considering continuing her studies -- if she can find a 4-year institution that offers an upper division curriculum that will allow her to remain in her community, retain her current job, and complete the remaining two years of traditional coursework in a 3 year period. Unfortunately, of the two 4-year institutions near to Mary's home, one does not offer distance learning programs, and the other has a program that relies on two-way interactive classroom that would require regular commuting to a regional teleclassroom. At these colleges, Mary would be able to take two courses per term and would need to enroll for 5.5 years.
>
> Mary meets with her current advisor, who is knowledgeable about traditional articulation and transfer programs, but who knows little about distance learning options and non-traditional transfer/articulation programs. However, the advisor does mention to Mary that he had read about the Western Governors University and about colleges and universities that were launching virtual campuses, but he has few details to offer Mary.
>
> At this point, she is prepared to explore out-of-state institutions but is not prepared investigate each institution, not even with the assistance of the Peterson's Guide (print or Web-based). This guide raises Mary's awareness of the many institutions that offer nontraditional programs, but at the same time, overwhelms her with information. Clearly, Mary needs help in making an informed choice that will guarantee a match between her needs and the best institution.
>
> Mary, who wants her degree plans to support her career aspirations, decides to speak with Sally, the human resource and training director at her company. Sally has been involved with an innovative company/union alliance that has been exploring new Web-based resources to deliver educational programs and services to the workplace. This company/union alliance involves the Public Broadcasting Service (PBS) and various

innovative colleges and service providers who are willing to redefine learning environments and explore new relationships.

Project ACCESS: A Suite of Decision-Making Services

Sally and Mary jointly log-on to the Project ACCESS interactive Web site and discover that they can enter information about Mary in a personalized Project ACCESS Career Management Account. Like any study/client who logs onto the ACCESS Web site, Mary uses her Individual Development Plan to plan out her educational and career goals. Her Lifelong Learning Portfolio can then provide educational institutions and potential employers with a wide range of information about herself, her academic preferences and experiences, and her educational needs and goals. For example, Mary discovers that she can explore experiential learning by identifying possible areas of competencies that she can pursue for credit via CLEP, Challenge Examination, and/or through a portfolio development process. Mary also may record in her Lifelong Learning Portfolio her preferences on a variety of topics, such as learning style and course deliver preferences. To help with this self-discovery process, Mary may even take the Myers-Briggs and other assessments online. Because Mary wants to transfer to an upper-division institution, she enters information in her IDP about the competencies that she wants to develop and the curriculum she wants to pursue.

Sally explains that this information in the Career Management Account can be accessed and interpreted by participating colleges, universities, and non-collegiate service providers. The privacy rights of individuals are respected and protected and Mary controls the levels of interactive relationships.

A Match between Mary and the Right College

Mary is able to use her IDP to match her expectations and preferences against the programs and services of the colleges that are participating in Project ACCESS. She can find out which of these colleges and universities can meet her curriculum interests, her career aspirations, and her delivery mode preferences. As a result of the interactive session, Mary is matched-up with four institutions that offer both distance degree programs in her major and the learner support services she will need.

Once Mary is matched up with the appropriate institutions, her CMA can provide her with unofficial and "tentative" transcript evaluations, so Mary knows what coursework or requirements she will need to complete at each institution. Given more time to assimilate the information, Mary plans to interact person-to-person with designated college personnel at the four institutions by using a variety of asynchronous communications tools available through Project ACCESS.

As a result of the self-discovery process offered via the ACCESS project's "suite of student-decision making services," Mary has identified new strategies to reach her educational and career goals. She is now equipped with new tools and resources that allow her to make better, more informed choices about her future. Mary's Career Management Account, Lifelong Learning Portfolio, and Individual Development Plan are a permanent and portable resource for her to enrich and use at her discretion, anytime and anyplace.

In Summary

PBS recognizes that a powerful factor for the quality of any product resides with the consumer. For Project ACCESS, it is the students who will require the high-quality distance learning products. The sophistication of these products and the ease in acquiring them will be the telltale sign of a successful system. Project ACCESS will make every attempt to provide the non-traditional adult learners, the consumers, with as much information in which to make a decision.

The smart consumers, freed from geographic and societal constraints, will have more to choose from and will insist on receiving the highest value possible for the money spent on their education. By linking education and training opportunities with career and occupational insights will increase the matriculation of a wider diversity of learners into educational programs that will lead them down a meaningful career path. PBS Project ACCESS will become a portal to distance education and provide student services in an interactive, Web-based format.

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Portions of this document were taken from the approved FIPSE grant proposal written by Will Philipp, Jacques Dubois and Glenn Shive. The full grant and other information can be found at the PBS Project ACCESS information site. http://pbs.org/als/access

For additional information about Project ACCESS, please contact Chris Reese, Project Coordinator, at creese@pbs.org

EDUCAUSE **Information Resources Library**

Transforming Education Through Information Technologies

Abstract

Category: Papers Presented at EDUCAUSE annual conferences

ID Number: EDU9943

Title: Pooling the Resources of Dozens of Schools

Author: Mahendran Jawaharlal

Organization: CARS Information Systems Corporation

Year: 1999

Abstract: With ever-climbing costs of supporting your administrative software, your institution needs the benefits of a virtual community of users from fellow institutions. Such communities pool resources and substantially keep down the costs of development, support, and implementation of software technology. Learn how to keep software support costs at a manageable level by sharing information across and between institutions through national and regional user groups, Web resources, dedicated listservs, and custom software contests. Discuss the required infrastructure behind these communities, how the technology must be industry-standard, net-centric, object-oriented and flexible.

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Pooling the Resources of Dozens of Schools

Mahendran Jawaharlal, President and CEO
CARS Information Systems Corporation
Cincinnati, Ohio

With ever-climbing costs of supporting your administrative software, your institution needs the benefits of a virtual community of users from fellow institutions. Such communities pool resources and substantially keep down the costs of development, support, and implementation of software technology. Learn how to keep software support costs at a manageable level by sharing information across and between institutions through national and regional user groups, Web resources, dedicated listservs, and custom software contests. Discuss the required infrastructure behind these communities, how the technology must be industry-standard, net-centric, object-oriented and flexible.

Introduction

You have Information Technology issues. Support costs and demand for IT staff are both on the rise. In addition, institutions struggle to retain their IT personnel, thus making it difficult to build and keep an adequately trained staff. We have solutions for you. We're here today to discuss ways in which you can successfully empower your end users with powerful instructional and support resources, and keep your personnel trained!

What's your solution? Well, for starters, an institution's choice of a "customer-intimate" solutions vendor, one that focuses its attention on your issues, is of primary importance. CARS Information Systems is one such vendor. In a Personal Information Manager (PIM)-integrated campus portal, the CARS Solution empowers users by offering powerful, industry-standard software tools, comprehensive support and consulting services, and training. Our powerful solution supports change control, allowing users to take control of their systems and implement custom solutions tailored to their individual needs. Vanilla is for ice cream, not enterprise applications.

In addition to powerful software tools and support services, CARS's customer-intimate solution helps to empower users with its client community--a virtual community of users, helping to keep institutions' support costs to a minimum. The virtual community pools resources by sharing information across and between institutions through networking resources, such as national and regional user groups, Web resources, and electronic discussion lists.

We'll get back to the specifics of solving your support issues, but for now, let's take a closer look at the IT support problems facing higher education.

Part 1 - The Problem: Costs/Staff Issues

The higher education marketplace has a wealth of choices for software solutions providers. In providing more and better solutions to higher education, software and support systems like the CARS Solution and its competitors have grown in features and complexity. These enhanced data solutions, as much as they improve your data processing capabilities, come with costs both predictable and hidden. These costs come from a variety of sources.

When you purchase a software system, you know up front the cost to purchase the system and its yearly maintenance. So, you ask, when do the hidden costs come in? Hidden costs occur in the ongoing support of the software system on your campus. One typical source of hidden costs is inadequate training and support to your end users and IT staff. When your own staff cannot handle support issues on their own, hidden costs can mount up. We'll phrase this issue in the following question: *How can an institution reduce hidden costs on support issues?*

Now let's look more closely at the IT staffing issue, which also contributes to hidden costs. In 1998, the issue of "Retaining, Retraining, and Recruiting Information Technology Staff," was identified by the then-CAUSE Current Issues Committee as a key ongoing issue "...important to the future of information resources management and...higher education." Indeed, hiring, training, and retaining IT professionals is an industry-wide challenge. The Bureau of Labor Statistics estimates that the United States is about 1.3 million people short of meeting the need for technical professionals. This problem is especially troublesome for institutions of higher education, which must compete with businesses that often offer higher salaries.

Another hidden cost results from the rising salaries required to keep and retain IT professionals. According to the Gartner Group, the historical annual growth for IT salaries is between 4 percent and 5 percent. Gartner projects an escalation of this growth rate to as much as 14 percent through 2000, due to the shortage of qualified labor. Finding and keeping IT staff is a costly challenge--creating the issue: *How can an institution reduce the need for a large IT staff?*

As for retention of IT staff, the Gartner Group suggests that institutions need to implement "...skills management as an ongoing program of investing in employees to make them more valuable to the institution as well as boost their careers. Such investment forms a key element of retention." IT staffing shortages and retention also cause related problems in keeping your institution's staff trained. When a knowledgeable user leaves, the overall institutional knowledge base declines, leaving the remaining users scrambling for answers. Keeping your staff well-trained and informed is another challenge--the issue here is this: *How can an institution keep its IT staff trained and supported?*

Let's look at solutions to these issues.

Part 2 - The Solution: Virtual User Communities

> "Largely due to improvements in digitalization, processing power, storage and communications, we have created a networking revolution. Higher Education will have a crucial role in developing these capabilities as well as training and educating those who will use them."
>
> -- Oblinger, Diana G. & Verville, Anne-Lee. "Information Technology as a Change Agent" *Educom Review*, January/February 1999.

Let's restate the three issues we just identified:

- *How can an institution reduce hidden costs on support issues?*
- *How can an institution reduce the need for a large IT staff?*
- *How can an institution keep its IT staff trained and supported?*

So, what's your solution? The solution is a **virtual user community**. Let's start with a definition.

> *A virtual user community is a social group whose members have common computing goals and issues and communicate with each other through common networking resources.*

Such a user community is *virtual* because it has no set physical location; its members reside nationally and are brought together through electronic media and conferences. The community's common interest: assisting each other in implementing, developing, and supporting their on-campus computing solutions. EDUCAUSE is an excellent example of a virtual community. You, after all, are all here this week to share, discuss, and possibly solve your common goals and issues.

How does this virtual community assist you? To begin with, you immediately empower your users by extending their resources beyond the limits of your physical campus! Through the sharing of information, you get a *virtual* extension of your IT staff and the knowledge available to your end users. Users get the support and advice from the community's power users, who are end users with lots of technical experience.

And what kind of support are we talking about? Not simply technical issues; we also are talking about discussion concerning the processes and procedures that go into managing an administrative office. The range of help can be virtually limitless! Typical community-asked questions might include:

> *"We are in the process of setting up Web registration on our campus? Can you tell us what processes worked and what didn't on your campus?"*
>
> *"Does anyone know how to print wide reports on a laser printer?"*
>
> *"I created the following select statement that really bogged down the engine. Can someone explain?*
>
> *select id, fullname, city, st..."*

Such communication brings vast benefits to members of the community. An active community brings a synergy of ideas and solutions to its participants. This synergy and knowledge sharing becomes a virtual extension of your institution's technical and administrative processes knowledge base. But even more, this communal-sharing extends to that of software code. Technical staff can test and share their code with their peers in the community. The overall benefit: *your resources are extended beyond the minds of your staff and the physical limits of your institution.*

Let's see how the virtual user community can address our three stated issues.

How can an institution reduce those hidden costs on support issues? As I previously stated, a virtual user community helps you reduce consulting and support expenses. When a user has an issue or question, the community, nine times out of ten, supplies an answer. Maintenance problems are solved within the community quickly and without the need for consulting services.

How can an institution reduce the need for a large IT staff? Each institution brings to the virtual user community a conservative average of 10 experts from the technical area and each functional area. With an active membership of, say, 100 institutions in the community, your administrative staff knowledge equals that of a staff of 1000 people! Thus, you are *pooling the resources of dozens of schools*! When you add to this the possibilities of sharing code, your IT staff does not have to "reinvent the wheel" with each new project. With this kind of support and knowledge, a smaller-sized IT staff can successfully support your institution!

How can an institution keep its IT staff trained and supported? By its nature, a virtual user community encourages knowledge sharing and training. After proper training from your software solutions vendor, the community continuously helps to build and reinforce your staff's training.

I hope it's now clear to you that an active and thriving virtual user community is vital to solving a good portion of your IT support and staffing issues. To be in such a community, your institution must have the right common solution provider whose solutions are powerful, customizable, and industry-standard.

CARS Information Systems supports its virtual user community better than any other vendor in the marketplace!

Part 3 - The Community Building Blocks

Rather than continuing to describe a virtual user community in general terms, we will use the active and thriving CARS virtual user community as an example of how such a community works! The CARS virtual user community is built on a solid foundation of the technical and support solutions of the CARS Solution, and is buttressed by user groups, Web and Internet resources, shareware, and flexible training programs. Let's start with the supporting structures of the community.

First, we'll discuss the community's bases of user communication. User groups make up the first form of communication between member schools. For example, the National Association of CARS Users (NACU), independent of CARS and run by elected officers from CARS client institutions, offers many opportunities for networking including tracks for training and discussion, cross-functional issues, and round tables. In addition to NACU are various regional user groups that meet at various times during the year. These groups allow for the discussion of regional issues, such as local and state reporting and a regional pooling of resources. Together these user groups provide many opportunities for community members to assist each other.

The second means of communication comes in the form of electronic communication resources. Currently the user community makes use of Client-Only Web pages, the NACU Web pages, and client-specific discussion lists for communication and support information. The Client-Only Web pages, for instance, contain support information including software updates, shareware, and white papers.

Online forums such as discussion lists play a vital role in a virtual user community, and provide the most direct and daily assistance to their members. A discussion list, run by a list server, receives email from individual members and broadcasts the email to all of the discussion list's subscribers. Discussion list participants communicate with each other on an almost constant, daily basis. The CARS lists include a general topics list, track-specific lists (such as student, financials, and enrollment issues), and a technical issues list. CARS also has plans to improve its clients' community with the addition of technology such as an online help desk, automatic/just-in-time software updates, and an extensive knowledge base available from a Web browser. In addition, we plan to improve our user groups' communications by encouraging technologies such as video-conferencing.

CARS's plans for a Web portal, a centralized gate for all online communication, will improve upon the current discussion lists. CARS's direction in regard to portals revolves around the institution's chosen Personal Information Manager (PIM), the focal point of each individual user's online communications, calendar, and business intelligence data. We envision having users use their PIMs linked to their campus portals to interact with the virtual user community.

Another important contribution to a virtual user community is shareware. CARS, for example, has collected a large shareware library, judged to be the "best of the best" in coding, through the NACU Software Contest. Contest entries, any projects that modify or enhance the CARS Solution at a local level, are submitted to and judged by NACU. Winners receive a cash award. The contest entries are then placed on the CARS Web site and made available for downloading. Entries with universal applications have been incorporated into the CARS Solution itself. Overall, this library has proven to be an enormously successful resource to clients.

I'd now like to discuss the virtual community infrastructure--the common solution across the community. For the community to work, for members to be able to assist one another successfully, the shared information must work across the community. After all, a virtual user community contains institutions that have their own individual and specific ways of doing things. To this end, CARS's continuing and future direction has been to provide its users with a powerful and flexible development platform. We provide industry-standard tools such as Web and UNIX-based solutions, and our solutions strive to keep our clients constantly up-to-date using a revision control system. This allows clients to keep current without losing their local changes--a vital aspect for keeping the virtual user community successful! Clients can modify their system to their heart's content; they can share local code with each other, and yet still remain current with CARS's latest enhancements. This is what we mean when we state, "When a scoop of vanilla just isn't enough!" You don't have to have a vanilla system--your campus solution should be as specialized and individualized as your institution!

And, as technology evolves, we constantly keep to our principles of providing technical power and flexibility to the community. Along with providing a personalized PIM-based campus portal, the next generation of the CARS Solution will be operating system- and database-independent. CARS will then give each member of its user community the flexibility to choose its operating system, be it an Intel-based platform such as NT and Linux, or the ever-reliable UNIX flavors, or to choose its database, be it Informix, Oracle, SQL Server, or Sybase.

Lastly, we'll discuss the services offered by your solution provider and how these contribute to the foundation of a virtual user community. This is where a customer-intimate vendor's solutions come into play. At every stage of your relationship with a solution provider, you should receive industry-leading services. CARS implementations, for example, lead the industry in the speed of completion. Clearly also, you should have support 24 hours, 7 days a week. As well, you should have access to services for those times where you need a little extra support, such as customizations, system administration assistance, operating system/database upgrades, hardware migrations, data conversions, Web consulting, and performance analysis, etc. This is your solution provider's contribution to the virtual user community. Your support issues will be solved, either by the community or by your solution provider!

In regard to training, well-trained and happy users are vital to our mutual success! Well-trained users make better contributions to the virtual user community and get the most benefits from the your administrative solutions. This is why CARS has developed flexible training programs designed to keep your users trained. CARS has a yearly schedule of training courses, computer-based training courses, and client site-based training programs determined by what best suits your needs. In addition, we also offer an institution-wide training program called *Education Advantage*, which, for a FTE-based fee, allows a school to send its staff to any and all education courses that it desires. Our "refresher" policy allows you to repeat a course, if needed.

In summary, CARS offers its services in support of the virtual user community to keep it thriving, yet self-sufficient. We emphasize training to provide the community with a good supply of expert users. To complete the picture, we contribute our support services to schools when they need us!

Conclusion

In conclusion, virtual community synergies reduce costs and increase knowledge by pooling the resources of all of its member institutions. The CARS Solution supports a thriving and self-sufficient virtual user community better than any other vendor in the industry. CARS does so because we bring all the necessary ingredients into the mix. These ingredients include a powerful, flexible, industry-standard technology, client-intimate support services, well-established user groups, and many electronic communication resources. And don't forget the cornerstone to the foundation of the virtual community--the CARS Solution's unique Revision Control System, which allows a school to retain its individuality, get benefits from the general user community, and yet remain up-to-date with CARS's latest enhancements.

And finally, if your institution would like to take advantage of the synergies of a virtual user community, we would love for you to join ours! The CARS virtual user community is vibrant and growing!

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Education," The Gartner Group, http://www.gartner.com, 2/23/98.

Endnotes

[i] *CAUSE/EFFECT*, Winter 1997-98, p.5.

[ii] *CAUSE/EFFECT*, Winter 1997-98, p.4.

> In a call for articles in the Winter 1997-98 *CAUSE/EFFECT*, the then-CAUSE Current Issues Committee listed current or developing issues and trends as key emerging or ongoing issues and trends important to the future of information resources management and use in higher education. Leading the list was the issue of "Retaining, Retraining, and Recruiting Information Technology Staff." The Current Issues Committee stated that "Our colleges and universities depend on effective use of information technology for instruction, research, and administration. With high demand for technology professionals, it is critical that we continue to recruit, retain, and retrain competent staff."

[iii] Syllabus, April 1999, p.53.

[iv] Gartner Group, "IS Staff Retention."

[v] Gartner Group, "IS Staff Retention."

> "Institutions should think of skills management as an ongoing program of investing in employees to make them more valuable to the institution as well as boost their careers. Such investment forms a key element of retention." The Gartner Group has stated that "Best-of-class enterprises spend 7 percent to 10 percent of their IT budgets on skills acquisition and maintenance while the average enterprise allocates only 2 percent to 3 percent."

[vi] *Educom Review*, January/February 1999, p.49.

EDUCAUSE *Information Resources Library*

Transforming Education Through Information Technologies

Abstract

Category: Papers Presented at EDUCAUSE annual conferences

ID Number: EDU9939

Title: Putting Java to Work at UCSD: A Success Story

Author: Ron Block, Henry Jaime, Jude Poole

Organization: University of California San Diego

Year: 1999

Abstract: For the last several years several groups at the University of California San Diego (UCSD) have been pursuing active software development using Java. We represent two of these groups and this paper shares some of our experiences and thoughts related to using Java to develop programs which are primarily designed to support administrative users in a university environment. While we have not found any mysterious previously unpublished secrets about Java we can share with you, we believe that we have learned much that can aid others who plan to use Java or are using Java for the same sorts of tasks that we have.

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Putting Java to Work at UCSD: A Success Story

Track 3: Wednesday, October 27

Ron Block, ACT
Henry Jaime, ACT
Jude Poole, Biology

Introduction

For the last several years several groups at UCSD have been pursuing active software development using Java. We represent two of these groups and this paper shares some of our experiences and thoughts related to using Java to develop programs which are primarily designed to support administrative users in a university environment. While we have not found any mysterious previously unpublished secrets about Java we can share with you, we believe that we have learned much that can aid others who plan to use Java or are using Java for the same sorts of tasks that we have.

Our Campus Environment

UCSD is the southernmost campus of the University of California System. Located in La Jolla, California, UCSD has approximately 18,000 undergraduate students, 2,000 graduate students and a very large research staff.

Administrative Computing and Telecommunications (ACT), the group two of the authors work for, is the central IS shop for the campus, housing an IBM mainframe, and numerous Unix servers. All of the Campus' core financial, payroll and student systems run on ACT's mainframe. Key data from these applications needed for decision support and other operations is provided via a campus data warehouse based on Sybase and hosted on Solaris servers.

The Biology Department at UCSD, where the third author works, is the largest general campus academic department with more than 3,000 undergraduate majors. Biology makes heavy use of ACT core applications and also provides local applications to its users which handle everything from research grant financial information to student activities.

Java development, both at UCSD and in general, can be somewhat artificially divided into three classes: applets, applications and servlets. Both ACT and the Biology Department develop servlets, ACT develops applets and Biology develops applications. We will briefly describe some things we are doing with each, how we are pursuing development in each area, why we made the decisions we did, and some things we learned along the way.

Applets

Background

In October 1997 ACT completed a new client/server application to be used in each department by designated departmental timekeepers for recording employees hours. A major design requirement was to provide a grid area which lets the user view and update a variable number of time lines for each employee. This program has now been used for 2 years by 225 timekeeper users, updating a monthly average of 21,500 lines for 8700 employees. This program has allowed our campus to eliminate the time consuming tasks of distributing paper timesheets to each department, collecting and keypunching the filled out timesheets, and producing edit reports which have to be verified by each timekeeper.

While this program has been very successful, being a client/server application requires that the application program and associated vendor software be individually installed and maintained on each timekeeper's PC. This often makes the timekeeper dependent on having technical support personnel available for software installation. Additionally, running the program on the most current operating systems would have required an upgrade to existing vendor software and significant system testing.

Decision to use Java applets

In early 1998, a decision was made to replace all campus-wide client/server applications with web-based applications. While most of the reporting applications could be written as CGI/HTML, an HTML presentation for timekeeping would not have provided a user interface that was equivalent to what the users had with the client/server product. In order to duplicate the ability to rapidly update lists of data, we decided to try building the application as a Java applet. Our decision relied heavily on our knowledge that the projected users were running primarily on fast campus networks with relatively powerful PCs/Macs. We also believed that most users would use the application over a long enough continuous period of time such that the load time for the applet would constitute a relatively insignificant portion of a typical working session.

Approach

One of our first decisions was the selection of an Integrated Development Environment (IDE) tool which would help with the GUI development of the application, as well as provide an integrated environment for coding, compiling and testing the program. ACT chose JBuilder, primarily because it allows relatively free-form changes to be made to the generated code. We also decided to develop the code using jdk1.1 which was just starting to be supported by the browsers.

Since our major goal was to develop a web replacement for a specific client/server product and complete it within a given time period, we decided to keep it as simple as possible without doing anything that would be too time consuming or too dependent on developing standards . We developed Java classes that were needed for the application, but did not attempt to design and develop reusable enterprise classes. We decided to perform all database access from within the applet using the Java Database Connectivity (JDBC) driver from Sybase. We also decided to avoid attempting to print from the applet, planning to use some combination of Perl/CGI, HTML, and PDF.

Servlets

Background

While several ACT applications required complex interactions with the users as described above, many of the applications provided by ACT for general campus clients use standard CGI/Perl to produce HTML. The use of a Perl/CGI framework was a reasonable and successful strategy for building these applications, but ACT came to believe that a more scalable solution was needed to support the rapidly increasing customer base and application development.

Decision to use Servlets

The existing Perl/CGI framework was well received by the users, but several concerns arose regarding the use of Perl/CGI. Perhaps chief among these concerns were performance and scalability. The Perl/CGI framework was written in such a way that converting it to use such techniques as fast cgi would have involved an almost complete re-write. Absent such a change, the framework was stuck in the usual CGI lifecyle involving a very large number of processes starting up and exiting immediately after serving one request. Unlike such CGI processes, Java Servlets can easily maintain state between sessions and maintain persistent resources, such as database connections. As a result, we believe that server-side performance can be improved significantly.

Another important reason for using Java Servlets to build the application framework was to take advantage of the benefits of Object Oriented Design/Object Oriented Programming (OOD/OOP) and the robustness of the Java language. An added benefit of using Java and OO was the increased potential for collaboration between campus departments interested in building common class libraries.

Unlike ACT, the Biology Department has not made a significant investment in CGI applications and so its decision to use servlets has a slightly different rationale. While Biology administrative users are accustomed to highly polished interactive applications which are difficult to match using HTML, non administrative users in the department are just beginningto directly access departmental database information and so have few pre-conceived interface notions. For these users the convenience of simply pointing a web browser at a URL is much more important than the highly customized interaction possible with applets or applications. Thus for business applications aimed at users whose primary job duties are not administrative, Biology has turned to servlets. These servlets, however, rely in most cases on the exact same object libraries (java packages) we use in our applications.

Approach

ACT began its transition to servlets by selecting and training existing staff members to use object oriented techniques and Java. The senior among those who advanced most quickly evaluated various servlet engines and settled on JRun as the deployment platform. Once staff was trained and JRun was selected, a migration plan was developed with the ACT Systems support staff. This involved a redesign of the existing CGI framework and identification of business, control and GUI classes.

The Biology Department has a much smaller development staff and followed a somewhat less formalized approach. Biology did not develop a complete framework, but rather concentrated on some specialized class libraries to handle parameters, generation HTML and PDF, and persistence of back end resources.

We have great hopes that the fruits of these two efforts can be successfully merged.

Stand Alone Client Side Applications

Background

The Biology department has used a variety of tools for general database programming including the Ingres 4GL based application development environment, custom Tcl/TK programs, OMNIS 7 applications and a variety of other languages. The applications created using these tools worked quite well, but the development support costs were significant and changing platforms was quite difficult.

Decision to use Java Applications

Faced with these problems with our then current development practices, Biology reviewed both current methods and a large number of alternatives. While a number of different approaches would have been adequate, it was felt that Java, particularly with its cross platform promise and strong object oriented foundation was the best option.

Once Biology made the decision to move to Java for all future development, we first focused on porting existing applications which had problems or needed significant redesign. Mostly these were traditional data entry applications for browsing, entering and updating a SQL based database (Sybase in our case). Most of the applications also have one or more complex functions such as ledger reconciliation and groupware like shared data interaction.

Approach

We decided very early on to focus on developing supporting object libraries and build our applications on top of these. Biology does not face quite the same urgency that ACT does for its applet projects, but at the same time has far fewer programmers than ACT. It was an absolute requirement that Biology reduce the maintenance and development costs associated with application development; the development of sharable support libraries seemed the only way to do that.

While Biology chose to create applications instead of applets, we still take advantage of Java's ability to do dynamic network class loading. Applets by their very nature use such class loading, but Java makes it quite easy to extend this mode of operation to traditional applications. Our most obvious use of this technique is our NetLoader. This is a stub class that implements only a custom class loader. This class loader looks to a hardcoded URL (which can be overridden on the command line or from within the program) and retrieves a list of applications, descriptions of those applications, initial starting classes for those applications and supporting class URLs. The user can select any of the applications and NetLoader will start that application, loading any necessary classes and resources over the network.

General Issues

While ACT and Biology pursue somewhat different development and deployment strategies, the lessons we have learned generally apply to most sorts of administrative Java development, whether for applets, servlets, applications or some mixture. Below we distill what we consider the most important points to consider when using Java as we do. As mentioned previously, none of what we have learned is secret or magical; we have simply tried to present as concise a list as possible of the key issues.

Development Coordination/Management

Perhaps the most serious management issue associated with Java is finding and keeping experienced Java programmers. Hiring such programmers from outside one's organization is both time consuming and expensive. Most of the Java programmers at UCSD are either long term employees who moved from other languages or are students/recent graduates. We believe that it is very important to be realistic about the time needed for such programmers to gain experience; to fully transition to objected oriented Java programming may in some cases take years.

In part because of the shortage of Java programmers and the resulting staff turnover problem, documentation is critical to Java projects. Java has a built in documentation system called Javadoc. It is both a commenting convention and a tool for creating HTML based upon those comments. Use of Javadoc will generally improve developer coordination, and we recommend it highly. It is also a very efficient way for managers to review some aspects of their programmers work. By itself, however, Javadoc is insufficient to properly document a Java project. It does not provide a convenient way to present a high level overview of a given package. Such an overview is particularly important for bringing programmers new to a project up to speed.

In addition to formal documentation, certain code design techniques can greatly ease managing Java projects. Java interfaces define an API without providing an implementation and therefore capture the essence of an object oriented programming contract between developers. The use of interfaces also greatly simplifies changing implementations and so is a great benefit to managers who may wish to defer tasks such as optimization without creating future havoc for their projects.

Interfaces are an excellent way to support partitioning of Java work, but other object oriented techniques common to many languages should not be neglected. For instance, Java provides strong language support for data hiding. Rigorous use of private members, in addition to being good programming practice, will make it much easier to share responsibilities within or between Java projects and provide clear boundaries for developers.

Object Design

The background of the administrative Java programmers at UCSD is quite varied. Backgrounds range from mainframe cobol to Macintosh pascal. Regardless of what non Java background a programmer might have, experience in applying object oriented principles using Java specifically is critical. Despite superficial similarities to C++, Java is quite different, especially in the way it is used. It is a nearly pure object oriented language. Writing a Java program, whether it is an applet, an application or servlet, can reasonably be viewed as a process of designing objects and interfaces, implementing them, and then wiring them together. The key to success in this type of environment is proper object design.

The objects to be designed can be broken down into two broad categories: reusable library objects and custom, implementation specific objects. The design of library objects is in most cases significantly more difficult and has a much more significant impact on the overall success of an object oriented project. It is crucial to give programmers who will be designing such libraries the training necessary to fully master object oriented programming and the time to develop experience designing in the Java environment. The design of the API to a given library is much more important than the actual implementation since Java allows you to cleanly hide the implementation details, but every piece of code written against a library will have dependencies on the API.

A big advantage of Java is that one does not have to design as many libraries as in some other languages. The core Java classes provide rich functionality and for many uses one can use these core classes. One key efficiency in object design is knowing when it is not needed and to simply use existing objects, including the numerous free and commercial third party libraries. ACT, for example, has had significant success with the KLG widget libraries.

Design of more mundane objects, while perhaps not as difficult or critical as that of library objects, is nonetheless a nontrivial skill. Good object design principles and knowledge of design patterns will prove invaluable to programmers working in Java. Code written without adherence to object oriented design principles may well work, but will not reap all the possible benefits of Java.

JDK Version Issues

The Java language version is usually indicated by the version of the associated Java Development Kit (JDK) from Sun Microsystems. The JDK's released so far fall into three key versions, 1.0.x, 1.1.x and 1.2.x. (A beta of 1.3 has also been released). Sun added some confusion to the mix by officially changing the name of Java 1.2.x to Java 2 (though both Sun and third parties will frequently use the 1.2 designation). In addition to the version number confusion, Sun has both Reference releases and Production releases. Reference releases are released first and are meant to define functionality and API's. Production releases come later and are optimized versions of the reference releases.

JDK 1.0.x has major problems, perhaps the most serious of which is the horrible event model for the AWT. In addition, several very important Java technologies, notably JDBC, were outside the core or missing in 1.0. While code written to the 1.0 API is generally upward compatible (though import statements are a problem for API's such as JDBC) , few choose to use the deprecated API's if they can avoid it. Since we can avoid it, we make no effort to remain 1.0 compatible.

JDK 1.1 introduced some major improvements. The AWT model in JDK 1.1 is much cleaner than the 1.0 version. Inner classes have been added and careful use of them can lead to cleaner, more easily understood code. Various API deficiencies were also remedied. Key new API's were added to the core, including, perhaps most importantly in our view, JDBC and servlet support. For these and other reasons (except in those cases where you must deploy applets in older browsers without 1.1 support) it is our recommendation that 1.0 not be used and that code should be written to take advantage of the improvements in JDK 1.1.

After the release of 1.1 and before the full release of 1.2 some major new packages were released by Sun. Swing, the part of the Java Foundation Classes (JFC) which provides a cross platform UI with pluggable look and feel is probably the most well known. Most of these packages have versions which work under 1.1. Wherever possible we use these packages in our 1.1 environment.

JDK 1.2 is a release which brings many nice features, but also a fair bit of controversy. Unfortunately we do not have the space to review the important issues to consider when choosing between 1.1 and 1.2.

Runtime Environment Issues

All Java programs run on a Virtual Machine (VM). While the VM's should (theoretically) conform to the Java Language Specification there is tremendous variation in speed, bugs, garbage collection, etc. We have stayed pretty much with the mainstream VM's, since by and large they provide us with the stability and performance we require. Below we discuss some concrete information on the VM's we have used and note some other VM's we think are worth considering.

The simplest VM choice exists on the Macintosh. There is only one VM under active development: the Macintosh Runtime for Java (MRJ). Earlier versions were quite poor and almost everyone uses the most recent version. Apple's version scheme for their runtime is slightly confusing: MRJ 1.5 is a JDK 1.0 environment; MRJ 2.0.x and 2.1.x are JDK 1.1 environments. Since the latest MRJ is a 1.1.x VM, one cannot run any programs which depend on 1.2 features (though one can use Swing and other post 1.1 features which have a 1.1 implementation available). MRJ has sluggish AWT performance and less than ideal I/O speeds (both largely as a result of Macintosh architecture issues). The most recent versions are largely stable and one of the Biology programmers uses Metrowerks on the Macintosh as a primary development platform (for work not requiring 1.2 features).

Under Solaris we use the JDK VM. The Java 2 VM's are much faster and we don't have any particular reason to use 1.1 VM's for anything other than testing. We have not done extensive testing of HotSpot, but what little testing we have done has shown no serious problems (and unfortunately no particularly huge performance win).

Under Windows we also the JDK1.2 VM. Its 2D performance is slower than we'd like, but we really like the support for custom class loaders. We have also used IBM's free VM, which is blazingly fast, but only supports 1.1.8 (they recently upgraded from 1.1.6). When IBM releases a 1.2 compliant VM we expect great things.

We don't run Java under Linux at the moment, but expect that IBM's 1.1.8 VM would be the one to use, at least when it gets beyond alpha. The Blackdown group is porting 1.2 to Linux with Sun's active support, but their timetable is quite unclear at the time of this writing.

For those who need absolute top servlet performance, TowerJ is worth a look. It is a compiler for Java in the more traditional sense. It heavily optimizes at compile time and creates a machine code executable rather than class files. This executable is then run like any other executable for the target system (and, of course, cannot be run on a system with a different architecture or operating system). TowerJ doesn't yet support the AWT, so one cannot use it for general Java work, but its benchmarks for servlet work are impressive. We would recommend carefully comparing other VM's performance for your particular configuration, however, since it is a commercial product and the other top VM's are essentially free.

ACT's applets are carefully coded to work with the Java Plugin from Sun. In addition the Netscape PC VM is supported.

Neither ACT nor Biology uses the Microsoft JVM. Biology programmers suggest careful thought be taken when considering this VM; it was once the clear performance leader, but current development plans at Microsoft are unclear at best.

When reviewing our experiences on various VM's, we believe that Sun's claims of "Write Once; Run Anywhere" are overstated. Many of the problems, however, come from VM bugs. As the VM market has matured we have seen fewer of these problems. And it should be noted that we have been very happy with cross VM development. Biology develops on Solaris, NT and Macintosh (except for 1.2 development) for deployment on all three platforms. Biology was once a heavily Macintosh shop. In part because of poor support for Java, we have moved away from Macintoshes. Planning for Java projects on the Mac will be complicated significantly by Apple's continued refusal (at the time of writing) to discuss any specific plans with regard to MRJ, especially any related to Java 2.

There is one final VM issue everyone should be aware of. The one area where the Java specification gives implementers a great deal of freedom is the thread priority model. While many VM's implement a similar model, it is quite possible for a VM to be completely compliant with the spec and yet have thread prioritization characteristics which surprise programmers. Anyone writing heavily multi-threaded applications should very carefully test on every target VM (which is good advice in general, but particularly critical here).

Performance

Java's performance has been an issue since the first release. The earliest versions of Java were very slow, but the situation has improved significantly in the few years since then. For our applications, current performance is more than adequate. Since both benchmarks and our first hand experience indicate that VM speed is improving steadily and significantly we have no real worries about this issue.

Despite our confidence, we would caution new Java developers that there is nothing particularly magical about Java or the new fast VM's. Poor algorithms, slow network interfaces, old hardware and all the other traditional causes of performance problems afflict Java programs at least as much as those in any other language. In fact, older hardware is often a more serious problem for Java programmers than C or C++ programmers because of the memory requirements of the VM's.

It is prudent software engineering to design and test with performance requirements in mind. Decisions about Java tend to be somewhat more complex, however, because of the large number of runtime environments to choose from. In our experience, fortunately, we have not had to make any major design or coding decisions because of VM performance limitations.

Browser Environment and Applet Issues

A Java applet is downloaded from a server as byte code and runs in a web browser. All current browsers come bundled with a virtual machine that is specific for the platform it runs on (i.e. PC, Mac, unix). Each virtual machine supports a particular version of Java and, although it must follow certain standards, will have certain variations between vendors.

The most current versions of Netscape and Internet Explorer support different versions of the Java 1.1 standard. On a PC, the only way to override the virtual machine of the user's browser is to code the applet HTML to require the Sun Java plugin. When requested by the Java HTML, it prompts the user to accept a download of the plugin software if it does not already reside on the local machine. On a Mac, although both Netscape and Internet Explorer provide a bundled virtual machine, the only viable virtual machine is the MRJ from Apple. Internet Explorer provides a method for configuring the browser to use the MRJ through a preference option.

For our timekeeping applet, we use a Perl CGI program to build the applet HTML. The Perl script detects the OS, the browser type, and the browser version. It uses this information to determine whether the java plugin is required and whether the proper Netscape or MRJ version is being used.

It is necessary to test an applet using every browser and virtual machine it will eventually run on. Despite the goal of write once, run anywhere, there are differences in virtual machines which can effect how the applet runs.

We also found the browser back button introduced some potential for confusion and errors. Once an applet was running and the user hit the back button and then forward to return to the applet, some browsers reloaded the applet and therefore the user could lose data entered but not saved to the database. We solved this problem by having the applet launched in a separate browser window, eliminating the ability to move away from the applet within that window.

When we began testing with different browsers on PCs, we found certain differences between Netscape and Internet Explorer as have many others attempting to build cross-platform applications. Netscape version 4.07 and greater was able to run the applet, but we found some navigation problems within the grid component when using Internet Explorer. We decided to use the Sun Java plugin product for Internet Explorer users to get the navigation to be consistent with Netscape users. On Macs, we were not able to run the applet until the Apple MRJ2.1 was released in early 1999. (The MRJ is a freely distributed product from Apple which must be downloaded and installed on each Mac). We also found that running the applet on a Mac platform required a higher-end Mac with at least 64MB of memory to obtain satisfactory performance.

Testing of the applet was more difficult and time consuming than comparable testing of a client/server application due to the number of pieces involved (such as the Java JDK, vendor components, JDBC drivers, browsers, and operating systems) and the retesting that must be done when any of these pieces change. It is also critical to perform testing on as many combinations of platforms and browsers as is feasible.

Server Side Communications and Database Access

For all our database access we use JDBC. This is the standard Java package for accessing data sources and code written to the JDBC standard should be portable to many SQL based databases (provided one does not use vendor specific extensions). So far we have relied almost exclusively on jConnect, the JDBC driver from Sybase (which is now free) and JDBC 1.x.

We use some wrapper classes to provide extended database support and to insulate our applications from the details of JDBC. One of the first things most java database programmers run across is the limitation of the JDBC ResultSet. ResultSets hold the results of queries, but they are unidirectional data structures -- once the programmer has advanced beyond a row of data it is no longer accessible. This is not a huge problem if you are sequentially processing the data, such as in a report, but for interactive form type applications one usually needs to store the data and perhaps scroll through it.

Security

By default, applets have no access to system resources outside the directory from which they were launched. This prevents an applet from being downloaded to a users PC and either reading or writing files on the local drives. This can be overridden by signed applets which must be accepted by the user.

Applets are also limited to the server resources they can access. A downloaded applet is restricted to accessing databases that reside on the same server from which the applet was downloaded, or may go through a proxy server that is running from the applet download server to access database on other servers.

Printing

Java support for printing started out quite poor and has evolved to semi-poor. We have chosen to sidestep the standard Java printing architecture and output documents as either HTML or PDF.

The HTML we use is generated primarily by servlets and, since it is intended for a browser environment, fits very well with user expectations. Unfortunately HTML is less than ideal at meeting precise printing requirements. Page breaks, headers, printed pages which look substantially different than the rendered HTML (lack of colored background for instance) are just some of the problems encountered by users. Designing an HTML document which looks roughly the same for all browsers (under all possible user preferences) is pretty much impossible. DHTML, style sheets, XML and similar technologies promise to address these problems, but none are completely here yet and it will be some time before all browsers support such features. Despite all these problems, HTML output is generally functional and the ability to view and print it is nearly universal.

For more precise printing requirements we use a custom developed Java PDF library. We examined a number of available third party libraries, but each had shortcomings that led us to develop our own. We only needed a subset of the capabilities of PDF, so we were able to simplify our development task by ignoring some of the more arcane aspects of PDF. Since PDF is an object oriented file format it is a natural fit for Java -- the core coding was done in several weeks.

Summary

Over the past two years, our Java development efforts have been very successful for developing administrative applications in a university environment. Since Java technology has significantly improved over that time and the trend continues, we firmly believe that our success with Java development will continue.While Java may not live up to the extreme hype which surrounded it initially, we have found it to be an efficient and effective tool for our applications development.

Your success with Java depends on the commitment of upper management and the ability to establish the necessary Java resources. Whether you choose to use Java applets, servlets, or applications, depends on your specific application needs and environment.

Resources

Web Sites

- JavaSoft
- Alphaworks (IBM)
- SwTech Java site
- The Java Lobby
- Java Developer's Connection (Sun)
- KLG
- Apache Java Project
- The Swing Connection
- JRun

Books

- Chan and Lee -- The Java Class Libraries (vols 1 and 2, 2nd Edition)
- Chan and Lee -- The Java Class Libraries (2nd Edition vol 1 supplement)
- Chan -- The Java Developer's Almanac

EDUCAUSE

Information Resources Library

Transforming Education Through Information Technologies

Abstract

Category: Papers Presented at EDUCAUSE annual conferences

ID Number: EDU9927

Title: Reaching Rural/Remote Americans

Author: Janet Poley, Dan Cotton, Ray Kimsey

Organization: ADEC, University of Nebraska, North Carolina State University

Year: 1999

Abstract: This summary of an EDUCAUSE '99 conference presentation focuses on leading-edge planning, strategy and technology to reach rural, remote and underserved audiences. A particular focus is wireless Internet and the importance of connecting the Internet2 efforts with the requirements in rural areas of less than 25,000 and inner cities. Implications for global knowledge networks are explored and management and business strategies including finances and costs are included. Poley introduces the vision and organizational dimensions and Cotton and Kimsey discuss the technology and its importance to university outreach and extension.

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REACHING RURAL/REMOTE AMERICANS

Dr. Janet Poley
ADEC

Lincoln, Nebraska

Mr. Dan Cotton
University of Nebraska
Lincoln, Nebraska

Mr. Ray Kimsey
North Carolina State University
Raleigh, North Carolina

This panel will focus on leading-edge planning, strategy and technology to reach rural, remote and underserved audiences. A particular focus will be wireless Internet and the importance of connecting the Internet2 efforts with the requirements in rural areas of less than 25,000 and inner cities. Implications for global knowledge networks will be explored and management and business strategies including finances and costs will be included. Poley will introduce the vision and organizational dimensions and Cotton and Kimsey will discuss the technology and its importance to university outreach and extension.

SUMMARY PAGE

The American Distance Education Consortium (ADEC) is working on several distance education projects designed to reach rural/remote Americans with higher speed and increased bandwidth learning opportunities. These efforts, being initiated by ADEC's 60 member institutions, Internet2 partners, Tachyon and NSF, will experiment over the next three years with satellite based Internet delivery. ADEC members are also actively involved with getting the message out that "distance education" should not be simply for the "near and the rich". Unfortunately, the whole notion of bringing the university to the people is not moving apace and services to communities of less than 25,000 people - remote by telephone company definition, historically black colleges and universities, Hispanic serving institutions, tribal lands and colleges and inner cities seem outside the bounds of all the hype. Janet Poley, ADEC President, presents the current situation with respect to trends and outlines a vision and strategy that should engage all universities and companies with a focus on the importance of reaching a larger proportion of the population with better services more inexpensively.

Dan Cotton, Head of Communication, Information and Technology within the Institute of Agriculture and Natural Resources (IANR) at the University of Nebraska-Lincoln, will present an overview of a technology strategy to be tested using satellite. He will also discuss the plans for testing, mentoring and applications development within this project. Cotton will describe the situation in Nebraska - a large geographic land mass, widely dispersed population, tribal colleges and agricultural base.

Ray Kimsey, North Carolina State University, will discuss the case of North Carolina where Raleigh-Durham is one of the top 10 most "connected" sites in the U.S. and yet the increase in connectivity has not yet reached the rural eastern and western parts of the state. Knowledge, finances and infrastructure constraints interact in creating disturbing blockages among those who most need digital education opportunities.

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Slides will be available at http://www.adec.edu at the time of the presentation and may be linked or we will provide to Educause depending upon preference. There will be an HTML outline version.

POLEY PRESENTATION

Distance education is not a new concept - it has had an interesting history as largely a print-based enterprise. Originally, distance education was viewed as a way to embrace place-bound learners and many modalities were used to "take the university of the people". Universities including Wisconsin, Iowa State, Nebraska and Tuskegee used every available means to reach out to rural and remote locations within the boundaries of the state. Delivery mechanisms included trains, wagons, planes, postal services, newspapers, radio and television. The early history of the Cooperative Extension service documents that people even walked out and into the farms and rural communities of this nation to disseminate educational programs.

So where are we today? While certainly radio, television and postal services continue to play a large role in distance education, high expectations have been created in rural parts of the nation, as well as inner cities and poorer communities that educational opportunities via Internet will be implemented in the early spirit of distance education and embrace the underserved. At present, there is much talk about a "digital divide."

The Department of Commerce has followed and documented this "divide" and recently Bob Heterick wrote: "The digital divide we should be worrying about is the unhappily slow rollout and high cost of high-speed digital connectivity. To produce really compelling learning applications on line, we will most often require megabit access. At the current rollout rate of our phone companies' digital subscriber line technology and the cable companies' symmetrical broadband services, we will be severely limited in what we can design in the way of new learning environments for quite some time to come." He suggests that we get to work on "this" digital divide.

The American Distance Education Consortium (ADEC) which includes 60 member universities is implementing a strategy to call attention to the fact that the "rollout" Heterick refers to considers communities of 25,000 and below to be remote and largely outside of corporate development strategies. Historically Black Institutions, Hispanic serving institutions and Tribal Colleges and Communities are also "distant" from the largely money-driven deployment of these important networks.

ADEC member institutions are working with Internet2 partners, private sector partners and the National Science Foundation to explore wireless Internet possibilities via satellite - "pretty good Internet, pretty soon, pretty cheap" to quote Tachyon, the company wanting to bring Tachyon Access Points (TAPS) into rural and remote parts of the U.S. as well as to developing nations. Other wireless options such as the Local Multipoint Distribution Service (LMDS) being implemented by Virginia Tech and Wavtrace, the ADSL deployment and radio wireless for certain circumstances, should all be explored and ADEC intends to carry the message nationwide that distance education programs and processes should not be reserved for the near and the rich.

Trend data from a recent ADEC study of local Extension educators, the Department of Commerce trend information and that of PricewaterhouseCoopers, will be included. Information about a new wave of energy and ideas into American agriculture from new immigrants is also examined as it relates to key target populations for distance education.

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COTTON PRESENTATION

Nebraska is a large state comprised of 76,878 square miles, 93 counties and a state population of 1,662,719. Over a third of the counties have a population of less than 5,000 people, two-thirds of the counties have a population of less than 10,000, only eleven counties have a population greater than 25,000. Nebraska is basically a rural state with a strong agricultural economic base. The Institute of Agriculture & Natural Resources (IANR) at the University of Nebraska is the only in-state provider of agricultural and natural resources education in Nebraska. It maintains linkages with the four campuses of the University of Nebraska, Nebraska College of Technical Agriculture, 1994 land-grant institutions, state colleges, and community colleges. IANR alone generates over 35 distance education credit courses statewide as well as a number of non-credit offerings in agriculture, natural resources and human resources and family sciences. IANR's statewide infrastructure supports teaching, research and extension. Today there are 83 Cooperative Extension county offices, five research and extension centers, and relationships with a number of other program related sites throughout the state. It is important for the University and IANR to have good access to the Internet; and while the research and extension centers have T1 connectivity, over 50 locations have dial-up access, with the remaining sites connected through a 56K Frame Relay service. It is important for all University/IANR locations to have "pretty good Internet" in order to access the services and resources of the University, and to provide citizens access to quality distance education. The University has developed plans and continues to pursue better data services, but providing good access via terrestrial connections statewide remains a problem. Wireless Internet service could be very important in the state of Nebraska and in other states with similar land-grant university educational responsibilities.

A partnership with Tachyon.Net, an international high-performance Internet carrier service, presents a real option for providing "pretty good Internet" to ADEC members. Tachyon can provide a Tachyon Access Point (TAP) system, comprised of a small satellite antenna, a radio assembly, a small indoor unit, and cabling, at each ADEC end-user site, providing communication via geostationary satellite to a Tachyon Satellite Gateway, where the traffic is directly routed to high-performance Internet1 and Internet2 links. The TAP can connect to a LAN at the end-user site via standard Ethernet, providing end-to-end connectivity to the high-performance Internet backbone networks. The Tachyon system provides two-way communications for high-performance Internet access across the entire satellite footprint of the continental United States. Service over the network will be controlled by a differentiated Quality of Service (QoS) scheme which provides the optimal price/performance levels for each end-user site with the potential for dynamic allocation of network bandwidth. Tachyon has designed the service specifically to process "bursty" IP traffic as efficiently as possible, allowing a capacity of up to 45Mbps on the forward channel. The Tachyon network offers two-way satellite communications, with reverse channel rates of 256Kbps. Tachyon links are transmitted as soon as they are received with no delay for reestablishing the connection. The high data rates reduce the duration of each transmission, minimizing the delay between request and response. Underlying this technique is a highly efficient patented link management methodology, and an enhanced over-the-air protocol, with standard TCP/IP on each end. Land-grant institutions are in need of such technology to fully realize the potential that "pretty good Internet" can provide. A schedule has been developed to test the technology and to evaluate the impact on program delivery.

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KIMSEY PRESENTATION

The number of users accessing the Internet from home has increased dramatically in the past several years (1999 PricewaterhouseCoopers, Consumer Technology Survey). This increase in connectivity is evident in the Piedmont of North Carolina where the Raleigh-Durham area is one of the top 10 most "connected" sites in the U.S. (April 1999, Headcount.com, Profile of the U.S. User). However, this increase in connectivity has not yet reached the more rural eastern and western parts of the state.

Financial barriers to reaching the more rural remote areas have been well established. These include:

- Higher expenses for providing services in remote areas.
- Larger percentage of low income families that in general have lower usage rates for the Internet.
- Less exposure to the Internet in schools and at work.

These reasons produce little incentive for traditional ISP's to reach to the remote areas. Newer services such as cable modems, ISDN and ADSL also have not reached these areas and are predicted to be at least several years away before they will become viable alternatives. A variety of small town telephone companies scattered throughout the state also further complicate the picture. Satellite and wireless technology may be a better choice.

To bring the Internet to county and state government agencies, the state has created an agency to provide connectivity to all local and state agencies. The North Carolina Cooperative Extension Service has relied on this service for our local county offices for the past three years. This service provides 56 Kbps lines to each local office and T1 lines to remote research centers. It was originally thought that the cost for these services would drop and all offices would be moved to at least the equivalent of T1 connectivity. Due to telephone tariff structures in North Carolina, this has not been the case.

EDUCAUSE *Information Resources Library*

Transforming Education Through Information Technologies

Abstract

Category: Papers Presented at EDUCAUSE annual conferences

ID Number: EDU9936

Title: Studies that Make a Difference: Tools for Faculty-Directed Inquiry and Improvement

Author: Stephen C. Ehrmann, Eugene K. Ressler

Organization: The TLT Group, U.S. Military Academy

Year: 1999

Abstract: The most useful and believable studies of courses and academic programs are those that instructors design themselves, focusing on those questions about which they care most. We present two systems that provide such tools to support the scholarship of teaching. First, a general purposes system for collecting information from students at the end of courses, developed by the U.S. Military Academy at West Point to coordinate academy, department and faculty inquiry and curriculum assessment. Second, Flashlight tool kits and training that focus on improving instructional uses of computing, video, and telecommunications.

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Studies that Make a Difference: Tools for Faculty-Directed Inquiry and Improvement

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Abstract

The most useful and believable studies of courses and academic programs are those that instructors design themselves, focusing on those questions about which they care most. We present two systems that provide such tools to support the scholarship of teaching. First, a general purposes system for collecting information from students at the end of courses, developed by the U.S. Military Academy at West Point to coordinate academy, department and faculty inquiry and curriculum assessment. Second, Flashlight tool kits and training that focus on improving instructional uses of computing, video, and telecommunications.

Introduction

The most useful and believable studies of courses and academic programs are those that instructors and directors design themselves, focusing on those questions about which they care most. We present two systems that provide such tools to support the scholarship of teaching. First, a general purposes system for collecting information from students at the end of courses. This was developed by the U.S. Military Academy at West Point to coordinate academy, department and faculty inquiry and curriculum assessment. Second, we present Flashlight tool kits and training that focus on improving instructional uses of computing, video, and telecommunications.

The USMA Course End Feedback System

Some Background on the System

When the United States Military Academy developed a model for centralized end-of-course feedback a decade ago, we eschewed the evaluative mode that has become so problematic in higher education (Gerstman, 1995). We opted for a purely formative system that provides information about an individual instructor's class solely to that instructor. Program directors, department heads, and the Dean all receive only aggregate information at their respective levels, information that is helpful for program assessment, planning, individual faculty development, but that does not allow for evaluation of individual instructor performance. In its original paper and pencil format, student feedback was limited to responses to a standard set of questions, and the scoring of surveys delayed instructor access to survey information. Our new electronic version is substantially more flexible and capable. It has expanded our ability to provide useful student feedback information at every level easily and quickly. Originally begun as a cadet design project in a computer science class and further developed by one member of the design team as an independent student project, in 1998, the authors, drawing on the cadet work, took the system to this "next generation" providing its current flexibility.

Principles and Operation

In brief, the system protects the anonymity of instructors through a system of PINs used to control views of information. It operates in a once-per-semester cycle. During phase I, designated individuals in each department, the "trusted agents," organize the department's academic program as a hierarchy that reflects its organizational structure by creating "nodes" for designated units; that is, its programs, courses, and sections. They determine "who sees what" by setting access lists for each node. A faculty member with access to a node may write survey questions and receive a tailored report for that node. For example, the English Department head may write questions, and the report he receives will represent what every student taking an English course responded to those questions, as well as the Dean's. The course director for freshman composition writes questions, and her report will contain the response of every student enrolled in freshman composition, both for her questions and those "above" her in the hierarchy---perhaps the core course program, the department head, and the Dean's questions. Each composition instructor can write questions for his or her sections, and the reports will contain the responses of only the students in those sections, but for questions at all levels of the hierarchy. However, although the instructor can see how his or her students responded to the department head's questions and the course director's questions, neither the department head nor course director have access to information at levels lower than their own. The faculty members have most of the semester to create the department hierarchy and write questions because phase 2, student response, does not begin until the final week of class.

During phase 2, students respond to a unique, personalized survey for each class section they attend, created by the system on-the-fly by joining questions of relevant nodes. For instance, a student in the freshman computer science core course, CS105, hour D, section 1, will receive a survey potentially formed from questions written by the instructor for the section, by the instructor for all his/her sections, by the course director of CS105, by the computer science program director, by the department head for all non-elective courses, and for the department as a whole. There is also a short list of standard questions for the entire Academy. While this may seem a daunting list, we have cautioned our faculty to make sure that individual student surveys not exceed a total of fifty questions and be closer to the thirty-question limit of our earlier paper version. Questions can be multiple-choice with or without a scale, with exactly one or any number of responses, and they can be "rank ordering" questions. Faculty members can ask for free text responses, which are delivered either only to the instructor (maintains high confidentiality) or "rolled up" at all nodes below the one where the question was asked (maximizes information). Questions can be "mandatory" or "optional" in the sense that surveys cannot be submitted while missing answers to mandatory questions. A sample of this system can be viewed at http://www.dean.usma.edu/feedback.

The system is in Perl for CGI over Microsoft IIS. Source codes are available on request. Mail ressler@usma.edu.

Observations

In its first two semesters of operation, the system collected about 20,000 responses each semester of 22,000 possible, about 91 per cent overall. We judge this a successful response rate. Note the system informs instructors of students who have and have not responded during Phase II, allowing for in-class reminders.

End-of-course feedback used as an evaluation of teaching is much criticized in higher education and remains largely because of what has been identified as the principle of *faute de mieux*, loosely translated as "lack of anything better" (Gerstman, 1995). A major problem is the tendency to mistake the numerical nature of the data with objectivity, ignoring the multitude of variables that affect student evaluation of instruction. However, when considered from the formative perspective, there is more of a tendency to see the feedback contextually, understanding it as the student impression of the learning situation and appreciating its value for certain types of information. For example, in our first semester core math course, the course director composed questions to obtain feedback on how well instructional intentions were meeting student learning needs, and he reported satisfaction with the results:

> *The feedback let us know that most of the cadets (71%) felt that technology helped them understand mathematical concepts, 77% indicated that the emphasis we place on concepts rather than formulas helped them learn mathematics, and the requirement that they communicate mathematics by writing and briefings helped them learn the mathematics (76%). We take that as an indication that we are doing what we hope to do. (e-mail message from MA103 course director)*

This same faculty member asked different questions of his own sections, seeking information about his individual classroom practices. He reported that he confirmed the value of cadets "going to the boards" to work problems but also students advised that he should be "more patient in waiting for cadets to finish problems on the boards," something he probably would not have learned without this type of feedback that allows fee text responses.

We conclude that the system has value for those who choose to employ it. It also imposes no administrative burden on those who do not. Future work will be directed at guiding faculty in question writing and in interpreting results. The academy level questions are also a subject of study by the faculty teaching committee.

Course Feedback References

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The Flashlight Program: History, Status and prospects

This essay contains a brief history of the Flashlight Program, summarizes its current operation, and suggests some future directions. Flashlight's goal is to help institutions evaluate and improve their educational uses of technology. The program is a self-supporting, non-profit operation, part of the TLT Group. The TLT Group is the teaching, learning, and technology affiliate of the American Association for Higher Education.

A Brief History of Flashlight

Flashlight was created in 1993 by the Annenberg/CPB Projects, where I was a program officer. We got initial funding from FIPSE and then Annenberg/CPB itself put up some substantial development money. That's why copyright for the tool kits is still held by the Corporation for Public Broadcasting. We moved to AAHE in 1996 and then helped found the TLT Group when it began operation separate from but affiliated with AAHE in 1998.

Our initial notion with Flashlight was to create a suite of standard survey and interview forms that could help departments and institutions evaluate and improve the usefulness of various technologies for supporting access and the seven principles of good practice (e.g., student-faculty interaction, student-student collaboration, active learning, time on task, etc.). The tools were (and are) designed for studies both of on-campus and off-campus learning.

Our work with our five institutional partners quickly convinced us that the thematic emphasis was right but that tool kits were more needed than tools. So we began painfully slow development of tool kits, starting with an indexed library of pre-tested items for gathering information from currently enrolled students (the Current Student Inventory or CSI). This came out in Dec. 1997 and has been site licensed by about 180 institutions around the world so far.

Next came our Cost Analysis Handbook (actually a methodology for studying the use of all resources, including time, along with case examples); that was published just a few weeks ago and already seems quite popular.

One of our institutional partners, Washington State University, volunteered to incorporate the CSI into a Web-based authoring and data collection/analysis system they were building. That was the genesis of Flashlight Online, a Web-based service for creating surveys, gathering data, and sharing studies that we rolled out about a month ago, thanks to a huge amount of work by Gary Brown, Peg Collins and others at WSU. Subscribers to Flashlight Online can currently use it to create surveys using CSI items; we'll add faculty items to the pool, too, later on.

We're also using Flashlight Online to return to our roots: creating standard surveys that could be widely used, with pooled data. In other words, users can use our survey, as is, and, if they're willing to share data, they can compare their students' responses with those from students in other institutions. The first such surveys are now under development: one in nursing for distance learning, one for use of presentation software such as PowerPoint, and a suite of surveys for use with course management systems.

We learned along the way that tool kits and tools were important but not enough. Our guiding philosophy has two important components (at least). First: what's most important is how a technology is used - it's the activity that should be the focus of the inquiry. The second point emerges from the first. If the particular use of technology is what determines benefits, costs, and problems, then evaluators face a problem. Their findings can improve those benefits, control costs etc. ONLY if their findings influence how lots of people use technology. But most users seem to pay little attention to evaluations and, if the findings reflect badly on what they do, they don't believe the findings. Solution: involve users in the design of studies so that the study actually focuses on issues about which the users already feel some uncertainty and concern - so that they are eagerly awaiting the data. But that requires attracting their attention so that they'll help design the study (we try to help local evaluation leaders attract their colleagues' attention by giving talks, writing articles, briefing people, etc.) and some training (where we try to help with workshops, face to face and, soon, online). We just ran two national workshops that people seemed to find wonderful, one at IUPUI on cost analysis and a second at RIT on evaluation of Web-based courses. If anyone on this list was at one of those workshops, they might want to comment. Those were nationally advertised workshops - we run 2-4 of those a year - but most of our workshops are on campuses and serve that campus, or its system, or perhaps also folks from neighboring institutions. (If you'd like to host such a workshop, please contact my colleague Amanda Antico at Antico@tltgroup.org or 202-463-1784.)

Finally, in addition to toolkits-tools and events-training we also offer active assistance, e.g., creating instruments for institutions or even doing studies for institutions (e.g., external evaluation of grants, external assessment of programs). For example, we're about to begin a fascinating study for Southern Cal on their interdisciplinary efforts to teach undergraduates more visual and interactive forms of academic expression.

Program Status Today

We bundle those three kinds of help (tool kits and tools; events and training; active assistance) as the Flashlight Network program. Institutional members get all our tools, inexpensive services, and the opportunity to play a leading role in Flashlight development. Members are quite varied in their technological and evaluation background - some wanting help to get started, some national leaders already. A few of them: University of Iowa, Massachusetts Institute of Technology (MIT), Fort Berthold Community College, University of Hong Kong, Regis College, UC Santa Cruz, Georgia Tech, Sinclair Community College, National University of Singapore, Stanford University, Regents of the University System of Georgia, Mount Royal College (Canada), Michigan Virtual University, University of Kansas Medical Center, Cal State Sacramento, Rochester Institute of Technology, Appalachian State University, Virginia Tech... You can get information on all this, including more information on Flashlight Network members and Flashlight licensees, starting with our home page at http://www.tltgroup.org/programs/flashlight.html

Future Directions

Our current thrusts will continue at least for the time being: helping as many institutions as possible develop the capacity to improve education with technology because they can evaluate what they're already doing. That institutional capacity is a combination of what faculty, staff and students can find out on their own and what they can find out together. We are especially excited about using Flashlight Online as a vehicle for helping faculty and institutions pool data and compare notes.

Flashlight's basic ideas emerged from talks and articles about "what works with technology" - my observations about areas where technology seemed appropriate enough, cheap enough, and easy enough for lots of institutions to use it. I've continued to watch the passing scene and our observations of current trends will shape new generations of evaluative tools. That's because we see evaluative tools in part as ways of measuring progress and investigating barriers to progress: for the country, for institutions, for programs and services, and for individual courses. That's how Flashlight works: describing key goals and concerns about technology use and then helping people decide how their own work can be gauged against those goals and concerns: For examples of a couple of recent articles that will shape our new work, see the September issues of *Educom Review* and *Academe*. Drafts of those articles are on our Web site at http://www.tltgroup.org/resources/varticles.html. One is called "Access and/or Quality? Redefining Choices in the Third Revolution." The second is called "Grand Challenges Raised by Technology: Will This Revolution be a Good One?" We look forward to hearing your comments about what we are doing and what we should be doing. Please send them to me or to Flashlight@tltgroup.org.

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Transforming Education Through Information Technologies

Abstract

Category: Papers Presented at EDUCAUSE annual conferences

ID Number: EDU9928

Title: Super-Partnerships: Computational Science Curricula, High Performance Computing and the Professional Organizations

Author: Kris Stewart, Roscoe Giles, Ilya Zaslavsky

Organization: San Diego State University, Boston University, San Diego Supercomputer Center

Year: 1999

Abstract: Since October 1997, NSF has supported two National Supercomputing Partnerships, led by the National Center for Supercomputing Applications (NCSA), University of Illinois at Urbana-Champaign, and the San Diego Supercomputer Center (SDSC), University of California, San Diego. The goal of this program is to create and maintain the national metacomputing environment, by supporting leading-edge technology and applications research, and promoting human, technological and administrative infrastructure for ubiquitous computing. This paper provides summaries of the individual presentations from the conference: (1) Building a faculty community to support curriculum development in computational science and engineering (Kris Stewart), (2) Repositories and Online Tools (Roscoe Giles), and (3) Sociology Workbench, an analytical interface to distributed resources for social scientists (Ilya Zaslavsky).

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Super-Partnerships: Computational Science Curricula, High Performance Computing and the Professional Organizations

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Since October 1997, NSF has supported two National Supercomputing Partnerships, led by the National Center for Supercomputing Applications (NCSA), University of Illinois at Urbana-Champaign, and the San Diego Supercomputer Center (SDSC), University of California, San Diego. The goal of this program is to create and maintain the national metacomputing environment, by supporting leading-edge technology and applications research, and promoting human, technological and administrative infrastructure for ubiquitous computing. The two partnerships, namely the National Computational Science Alliance [1] and the National Partnership for Advanced Computational Infrastructure [2], unite over a hundred leading research universities and national labs over shared use of high-performance computing resources, advanced compute-intensive research, and a variety of education and outreach efforts. These efforts focus, broadly speaking, on promoting computational science curriculum in K-12, undergraduate and graduate schools, and informal learning communities, on shortening the distance between research labs and classrooms, and developing learning tools that utilize the best modern scientific accomplishments.

With the dramatic changes in computing, the need for dynamic and flexible computational science curricula becomes ever more obvious. Computational science has emerged, at the intersection of computer science, applied mathematics, and science disciplines (see Fig. 1) as a third component of science, in addition to theoretical investigation and experimentation. Mastery of computational science tools, such as 3D visualization and computer simulation, efficient handling of large data sets, ability to access a variety of distributed resources and collaborate with other experts over the Internet, etc. are now expected of university graduates, not necessarily computer science majors. However, the existing infrastructure on university campuses (human, technological, administrative) is often inadequate for the task. We described in [3] at least ten obstacles to a wider acceptance of computational science in undergraduate education; most of them are not technology related. As shown in several faculty surveys, the lack of a system of rewards encouraging time-consuming curriculum innovations, low awareness of faculty and students about available computational science tools, and the absence of a support network are among the main challenges. The joint EOT-PACI [4] activities of the two partnerships have focused on these challenges. Case studies of successful projects, presented by speakers in this panel, show that a comprehensive approach is needed in promoting computational science in university curriculum. Computational science curriculum workshops for undergraduate faculty (offered in Boston and San Diego), the SDSU/NPACI Faculty Fellows program, development and use of on-line "workbenches" (Biology Workbench, Sociology Workbench, etc.) which mobilize domain-specific Web resources for both research and teaching, participation in important campus-wide networking and security initiatives, experimentation with advanced technologies in the classroom – these and similar focused efforts, when propagated throughout the two partnerships, appear to have impact beyond the individual teaching experience, and scale to the national level.

The emerging infrastructure for computational science in education will be successful if it uses the established intertwined professional networks and societies from both educational and computer technology fields. EDUCAUSE is a prime example of such an organization which may support computational science curriculum development through sharing expertise and providing an environment for disseminating new technologies and approaches, and a forum for vendors, educators and researchers. Inter-disciplinary exchange of ideas, methodologies and experiences, under the EDUCAUSE framework, is an important component in establishing a scalable nation-wide comprehensive infrastructure to support computational science education.

[1] NCSA: http://www.ncsa.uiuc.edu

[2] NPACI: http://www.npaci.edu

[3] Stewart, Zaslavsky, 1998 "Building the Infrastructure for High Performance Computing in Undergraduate Curricula: Ten Grand Challenges and the response of the NPACI Education Center. Supercomputing'98 Proceedings. Available online at http://www.supercomp.org/sc98/TechPapers/sc98_FullAbstracts/Stewart1310/index.htm

[4] EOT-PACI: http://www.eot.org

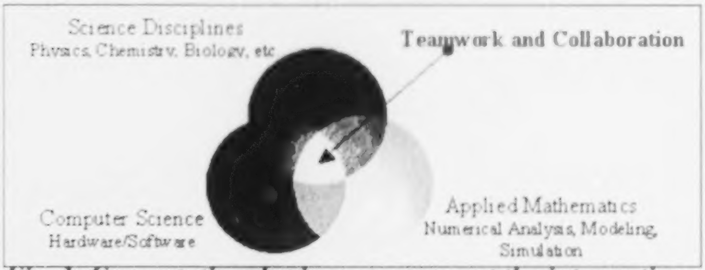
Science Disciplines
Physics, Chemistry, Biology, etc
Teamwork and Collaboration
Computer Science
Hardware/Software
Applied Mathematics
Numerical Analysis, Modeling, Simulation

Fig. 1. Computational science emerges at the intersection of computer science, applied mathematics, and science disciplines.

Summaries of individual presentations:

1. Building a faculty community to support curriculum development in computational science and engineering (Kris Stewart).

Education Center on Computational Science and Engineering was established on the campus of San Diego State University in October 1997, as part of education and outreach activities of the National Partnership for Advanced Computational Infrastructure (NPACI). From inception, its focus has been on building a comprehensive educational infrastructure to support the incorporation of high-performance computational science tools into undergraduate education. Through the campus-wide Faculty Fellows program, collaboration with NPACI and NCSA researchers, in-house project development, and various outreach efforts, we have established an environment encouraging the curriculum enhancement in sciences and engineering with modern simulation and visualization technologies.

With over 31,000 student body, SDSU is the largest university within the California State University (CSU) system, which in turn, is the largest and most diverse undergraduate system in the nation. The diversity of students is reflected in diverse faculty, diverse teaching techniques and methods, emphasis on and attention to individual learning and teaching styles. We examined SDSU faculty expectations and practices in teaching with computers, based on a series of questionnaire surveys and interviews. Analysis of faculty use of the Web, use of computers in the classroom by students and instructors, and the use of high performance computing applications in the curricula, helped us develop Ed Center strategies of curriculum change.

During the first year we focused on broad dissemination of the available computational tools, by

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presenting to various faculty audiences at SDSU and other campuses of the California State University system, and by experimenting with various computational technologies in our own classroom teaching. The main focus of the second year activities has been on individual collaboration with selected SDSU faculty, and on in-house computational science projects. The Faculty Fellows program initiated by the Ed Center, have provided release time to three faculty members selected from Colleges of Sciences, of Engineering, and of Arts and Letters, who work on changing their regular courses to include computational approaches. This support allowed the faculty fellows to use various compute-intensive approaches in undergraduate teaching ranging from interpretation of satellite imagery and web-based collaborative visualization of large geological datasets, to the exploration of the Network of Workstations (NOW) distributed architecture implemented on a cluster of SUN workstations at the College of Engineering, to investigating new Web-based 3D visualization strategies for geographic data in an experimental class composed of geographers and computer scientists. Presentations of the faculty fellows' projects to University administrators, to various professional audiences, and positive feedback from students, became an important testimonial to the initial success of the program. The synergy developed through a series of faculty fellows meetings and discussions at the Ed Center, has resulted in collaborative research projects involving faculty from different colleges.

The Ed Center also organized a Computational Science in Undergraduate Curricula workshop for CSU faculty, has developed several in-house projects on distance learning, networking, and on-line analysis tools. These projects are also discussed in the presentation.

For more information visit our Web pages at http://www.edcenter.sdsu.edu

2. Repositories and Online Tools (Roscoe Giles)

We are at an important transition in computational science and education. As more computer resources, instruments, information repositories, and collaborators join the worldwide information network, we are moving from static data repositories to "workbenches" and "portals" which are designed to support science and education more effectively. The two NSF Partnerships for Advanced Computational Infrastructure (NPACI and the Alliance) are pioneering the development of such online tools.

This presentation summarizes some of the technologies that underlie the development of advanced online tools and shows some examples of directions being taken to support computational science education. We hope to stimulate useful discussions of requirements and design goals for new tools.

The Biology Workbench, introduced in an earlier presentation, has served as a successful prototype of several aspects of a scientific portal: availability of a wide variety of data and computational tools, persistent user state, and behind the scenes translations of data formats. We have worked with the Biology Workbench for education and will describe some of the additions/extensions that support collaboration and learning by novices.

We then turn to a discussion of the expected impacts of newer web technology such as XML on the efforts to build effective computational science repositories.

3. Sociology Workbench, an analytical interface to distributed resources for social scientists (Ilya Zaslavsky)

Both the NPACI and NCSA programs have a strong focus on "hard" sciences. Indeed, such academic fields as computational physics, molecular biology, computational chemistry, climate modeling, have traditionally used high-performance computing to process large volumes of data, simulate and visualize natural phenomena. The majority of high performance computational science tools developed, in particular, at the San Diego Supercomputer Center, target the community of researchers in sciences and engineering. In the social sciences and humanities, the use of computational science tools, especially in the classroom, has been limited. Addressing this curriculum need, we have developed a collection of on-line computational tools and resources for social scientists, codenamed "Sociology Workbench" (SWB). The SWB allows faculty and students to share and analyze social science data (questionnaire surveys, public opinion polls, and similar data) on the Web. The major advantage of our workbench is its ability to examine datasets supplied by the user, in addition to widely used public domain data such as the General Social Survey. In essence, it is a free on-line statistical package implementing a unique data analysis methodology.

The Sociology Workbench continues the technology of on-line "workbenches" being developed for various disciplines within the supercomputing realm (as, for example, the Biology Workbench developed at NCSA (http://biology.ncsa.uiuc.edu/), the Scientist's Workbench from Cornell (http://www.tc.cornell.edu/SWB/swb.html), the NASA's Environment Workbench (http://satori2.lerc.nasa.gov/DOC/EWB/ewbhome.html), etc.). Instead of re-writing widely available on the desktop statistical procedures for categorical data analysis, we emphasized exploratory social data analysis, integration with other resources available on the Web, convenience of the user interface, and transparency of the analytical approaches. The core of SWB follows the methodology of the Analysis of Rules (Determinacy Analysis), a method for extracting explanatory rules from series of qualitative variables such that these rules are as accurate and complete as possible. In addition, users can build custom variables and add them to the "dictionary of variables", construct standard frequency tables and cross-tabulations, pie- and bar-charts.

SWB is being developed by mostly undergraduate students working as interns with the Education Center on Computational Science and Engineering on the campus of San Diego State University. It is expected to serve as a teaching tool in classes dealing with survey data analysis, as well as an engine behind portals which provide analytical access to discipline-specific survey datasets. The software has already been used for analysis of faculty surveys, student surveys in several classes, by local planning agency, etc. As a research testbed, we are using SWB for analysis of interfaces to distributed data sources within a wrapper-mediator architecture. You are welcome to analyze your surveys with SWB, it is accessible from http://edcenter.sdsu.edu.

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Transforming Education Through Information Technologies

Abstract

Category: Papers Presented at EDUCAUSE annual conferences

ID Number:	EDU9904
Title:	Sustaining A Virtual Support Organization: The Learning Technologies Partnership, A Model for the New Millennium
Author:	Barbara Hoffman, James Austin, Karen Williams
Organization:	The University of Arizona
Year:	1999
Abstract:	To meet the ever-growing demand to integrate information technology into all aspects of university life, the University of Arizona has been exploring new support models. One of the most successful strategies for improving the instructional environment is found in the Learning Technologies Partnership. Created in 1995 to improve support and expand development opportunities for teaching faculty, the functional links between diverse service units--computer center, library, teaching center, video services, a new media research center, and the extended university--now support a "virtual organization." The impact of this virtual organization is felt across the curriculum. In its fifth year, the Partnership is preparing to step beyond "doing" to help lead the UA into the next millennium.

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Sustaining A Virtual Support Organization
The Learning Technologies Partnership
A Model for the New Millennium

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Abstract

To meet the ever growing demand to integrate information technology into all aspects of university life, the University of Arizona has been exploring new support models. One of the most successful strategies for improving the instructional environment is found in the Learning Technologies Partnership. Created in 1995 to improve support and expand development opportunities for teaching faculty, the functional links between diverse service units--computer center, library, teaching center, video services, a new media research center, and the extended university--now support a "virtual organization". The impact of this virtual organization is felt across the curriculum. In its fifth year, the Partnership is preparing to step beyond "doing" to help lead the UA into the next millennium.

Sustaining A Virtual Support Organization
The Learning Technologies Partnership
A Model for the New Millennium

Historical Context--Paving the Way

Developing a technology enriched, pedagogically appropriate instructional environment at the University of Arizona has involved a variety of partnership efforts since the late 1980's. A broad collaboration of visionary faculty supported by a few key administrators and many creative, diligent support staff have made enormous progress possible. All aspects of the University have become involved in one way or another.

One of the earliest partnership efforts was spawned from the 1988 Academic Computing Advisory Committee (ACAC). The ACAC was a long-standing faculty committee convened to advise the Provost on needs related to research computing. In those days, undergraduate computing needs were little considered and primarily met with "left over CPU cycles" on research mainframes and meager lab resources. That began to change when a mathematics professor insisted that a survey of departmental instructional needs must happen. Hence, the ACAC Subcommittee on Instruction was convened and a new alliance created between committee faculty and central computing staff. This ad hoc coalition worked together gathering campuswide data and compiling a status report complete with recommendations for moving the UA toward the next millennium.

That first report put a spotlight on instructional computing as a distinct, mission critical arena and established a foundation upon which to refine a campus vision and build an instructional support infrastructure. Between 1988 and 1993 a ground swell of activities increased the pressure on UA administration to improve the funding for instructional technology and bring it closer to parity with research and administrative expenditures. Central unit projects began to address the campuswide context. With "one-time" funding, The Center for Computing and Information Technology (CCIT) installed five new open access labs that housed two hundred PC and Macintosh computers in various classroom buildings and residence halls. New FTE were hired to staff these labs. CCIT also brought online an instructional conferencing system and started a small faculty support center. The UA Library launched its electronic library system, SABIO. In colleges, several innovative faculty projects gained local and national prominence. In 1990 the first faculty-staff instructional computing advisory committee (ICAC) was appointed, and its 1991 Report to the Provost clearly articulated a futuristic campus environment and a framework of strategies to make it happen.

Relentless ICAC lobbying paid off in 1993 when the President and Provost used a portion of new tuition dollars to establish a separate instructional computing (IC) budget. The ICAC was asked to prepare recommendations on how a 700K budget should be allocated. After conducting a needs assessment it devised a strategy that refreshed the needful CCIT labs, provided seed money to establish a multimedia learning lab, and created a grants program to support faculty and department projects. (In subsequent years direct funding for central resources lessened dramatically and the IC Grants program expanded to create more opportunities for competitive campuswide development.)

UA administrators soon faced the fact that meeting rapidly escalating technology demands would not be possible through reallocation of available funds. Efforts were made to institute a technology fee, but it fast became clear that such a fee was not acceptable to either the students or the Board of Regents. So, the Provost and the Vice-Provost for Academic Affairs decided to launch a technology-focused campaign aimed primarily at the State Legislature. The intention of this crusade was two-fold: to raise consciousness of the importance of information technology in higher education and ultimately to increase state funding for "new learning technologies". Again, a partnership of faculty, administrators, and staff came together to articulate an updated vision that in turn became a "road show" complete with interactive multimedia and an enthusiastic, articulate Vice Provost presenter. And it worked…at least in part. A 4.5 million-dollar New Learning Technology Budget was submitted--940K was permanently funded.

This was an exciting victory, but it presented a dilemma as well. The original budget called for a wide spread disbursement of the new moneys to support centralized and decentralized personnel and operational needs. With only 20% funding a new strategy was required.

The choice to associate the New Learning Technology Budget with *faculty development* came about because our Vice Provost for Academic Affairs was actively engaged with the faculty seeking ways to improve the teaching process. During the prior year, through an open call for participation, she had organized a Faculty Development *Team*, which met regularly to discuss a wide range of issues. Several members of this group were very vocal about needs associated with instructional technology and excited about the possibilities a new budget presented. Thus was born the Faculty Development Partnership, a "virtual organization".

Creating and Sustaining the Virtual Organization

The Faculty Development Partnership was established in June of 1995 as an operational alliance of five service units. The Center for Computing and Information Technology (CCIT), the UA Library, the University Teaching Center (UTC), UAVideoServices, and the Peter Treistman Fine Arts Center for New Media joined together in order "to provide expert technical support; mentoring and collaborative opportunities; technology for courseware creation, teaching and learning; and approaches for measuring learning outcomes." Each member unit appointed a Partnership representative who had an extensive background "in the trenches". Each representative could participate in meetings and other activities from a position of responsibility and authority over unit technology resources and personnel. In it's first iteration, the Partnership group was made up of one faculty member acting as Director of the Treistman Center, one Librarian team leader, the Director of VideoServices, an instructional specialist from the University Teaching Center(UTC), and the staff Manager of CCIT Instructional Support. In addition to the five unit representatives, the Provost Office appointed a Faculty Associate for Faculty Development. Each member of this original core group was a passionate advocate of learning technologies and all shared a vision for collaboratively moving the UA forward.

At its inception each Partnership unit had a distinct history of providing support for teaching faculty and students.

- CCIT was the central technology department responsible for providing broad services that touch all members of the University. In 1995, the primary Partnership affiliation was through CCIT Instructional Support, a unit responsible for maintaining computer labs, shared-host applications such as computer conferencing and instructional web servers, and for assisting faculty in the use of central computing resources. CCIT Instructional Support also was home to the Multimedia and Visualization Lab (MVL) and a small faculty support facility--the Faculty Resources for Instruction (FRI).
- The UA Library was expanding SABIO as an electronic gateway to its growing collection of electronic journals and network information resources. The Library was also planning for the addition of a computing commons and expanding its mission to include information technology literacy training.
- The UTC was assisting UA instructors seeking to improve their teaching and take advantage of new pedagogical understandings. The UTC was also responsible for technologies in campus classrooms and was launching an initiative to renovate and modernize university classrooms. Demand for access to instructional technologies to support development and deployment of new materials was rapidly increasing.
- UA VideoServices was the instructional support arm of the KUAT Public Broadcasting organization and a charter member of the National Technological University (NTU). Responsible for cable and satellite delivery of instructional materials, VideoServices was seeking to increase its presence in mainstream faculty support endeavors.
- The Peter Treistman Fine Arts Center for New Media, was a newly established research center within the Fine Arts College, devoted to exploring the use of multimedia in Fine Arts scholarship and teaching.

The Faculty Associate was a technologically astute and highly committed individual. In this role, she complemented the capabilities of the unit representatives and provided the Partnership with a critical link to the faculty at large and the avenue of communication needed between the Partnership and UA Administration. Our intention was to share in the planning and execution of strategic activities, maximized available resources and minimizing duplication of efforts. The collection of characteristics and capabilities brought together in the Partnership inspired our belief that the new virtual whole would be far greater then the sum of its parts.

The Provost's office empowered this group to define the 940K budget priorities for our first year of operation, FY 95-96. During that time Partnership representatives met often, at least once per week as a group, and even more often in working teams of 2 or more. Unit representatives were busy gaining knowledge about each while building a distributed coalition of expert staff that incorporated existing personnel with several new positions added in CCIT, UTC, the Library and the Treistman Center. Established technology settings--CCIT labs, the UTC classroom, and the FRI--were improved and the Library opened a prototype information commons. At the same time, IC grant opportunities increased with the addition of a second competitive program designed to foster innovation with seed funding for individual pilot projects. In addition, our Faculty Associate championed awareness by pushing faculty and administrators into focused retreats, sponsoring campus open house events, and motivating her peers to develop broad-based collaborative team projects. Several of these projects continue today, most notably the UA Southwest Project.

In year two, the Partnership was again allowed a large measure of budgetary control. That year our efforts turned toward developing industry partnerships and to creating a large-scale faculty support center. We nearly succeeded in the first endeavor coming very close to establishing an alliance with the then new Lucent Technologies. While no partnership was ultimately created, the experience provided an invaluable education in corporate / university politics. After the fact we realized that no single shared vision had ever been affirmed. Rather, two camps had developed with some stakeholders on both sides operating under diverging assumptions. While academics worked with research and development folks excitedly mapping out product development strategies, the marketing and sales agents were doggedly insisting on hard-dollar financial commitment and long-term "sweetheart deals." Despite our best efforts to inspire faith-in-the-future, ultimately the key decision-makers could not come not come to terms.

On the other hand, our plans to develop a faculty center were wildly successful. With encouragement and financial support from the Provost, renovation of empty space in the Computer Center was completed. A generous contribution from UA Foundation resulted in enough money to equip much of the Center. Resources previously housed in CCIT Faculty Resources for Instruction and the UTC Faculty Classroom were relocated so that when all was said and done, only a small portion of the New Learning Technologies budget was needed to establish a fully operational Faculty Center for Instructional Innovation (FCII). The doors officially opened on April 1, 1997--the same day our Arizona Wildcats came home to celebrate their NCAA basketball championship, a coincidence we accepted as a very good omen.

The FCII is a 7,500 square foot, multi-purpose environment serving teaching faculty, graduate assistant teachers, and instructional support staff. Its purpose is to provide a dynamic interdisciplinary environment that supports exploration and development of new pedagogy, instructional technology, sustained collaborative experiences and distributed educational opportunities. Basic to advanced user services are provided on a walk-in basis and by appointment. FCII equipment includes computers suited for everything from web browsing and word processing to image scanning and multimedia content development. Consulting and training expertise derives from a wide range of skills and talents including graphic arts, web design, analog and digital video production, multimedia authoring, and much more. FCII offers many resources for loan: laptop computers, digital cameras, evaluation software (800 packages), training aids, and ergonomic devices. The FCII was constructed to be flexible. Moveable partitions have been arranged and rearranged to accommodate changing work groups. The current Faculty Associate keeps an office there along with a growing number of staff devoted to the UA's Distributed Learning Initiative. Soon, the team workroom will house several programmers hired to work on a FIPSE grant project. The Center supports four meeting spaces, which can be reserved to accommodate small to large get-togethers. The presentation area can be setup with a large conference table room or configured as a demonstration site for an audience of up to 50. Open meeting areas (one is a small couch lounge) assist spontaneous collaborations as well as formal group gatherings. These spaces are in high demand and when two or more meetings happen simultaneously the Center becomes a *very* lively place.

The year following implementation of the FCII, 1997 – 98, was a time in which administrative and faculty leadership changed dramatically. The Partnership lost both its Faculty Associate and the Vice-Provost who was our principal administrative champion. Both were "lured away" to positions at other universities. These losses resulted in a serious blow to our ability to behave as an autonomous virtual unit. Decisions regarding Partnership direction and budgets were now made by the Office of Undergraduate Education and an administration that could not appreciate the loose structure, less traditional budget planning and reporting relationships that sustained our virtual organization.

In year three the Partnership endured and advanced through the community of unit representatives and the coalition of expert staff. Several unit heads, particularly the Library Dean and the Director of UTC, encouraged us to maintain our commitment to the Partnership ideal and were instrumental in protecting the funding allocations for existing staff and FCII operations. In spite of difficult changes, loss of budgetary control, and uncertain leadership, there were many successes to report that year. Expanded use of labs as electronic classrooms; new partnerships with academic departments; 24-hour access to the Library Information Commons; addition of a Copyright Librarian; implementation of a classroom network that provided teachers with efficient access to the Internet; new training opportunities for faculty; another successful grants program; integration of new technologies and additional unit staff into the FCII, were some of the achievements. In year three, CCIT increased its commitment to the Partnership by adding the Network Operations Group as a sixth core unit. The group manager assigned became a second CCIT representative.

By July 1998, the beginning of year four, a new Faculty Associate had been appointed to serve the Vice President for Undergraduate Education and assigned to the Partnership. This Faculty Associate was charged to oversee faculty development, but also to guide the development of a distributed learning architecture. The administrative mandate related to distributed learning strongly emphasized a particular bias: to solve problems affecting UA's residential students as opposed to creating programs that would attract new students seeking distance education. At first the constraints of this approach seemed arbitrary and confusing. The impact on the Partnership was a struggle that forced each unit representative to examine the Partnership in light of changing times. Throughout several months weighed down by internal assessment, the operational alliance continued to produce exciting results. Particularly successful projects included the Faculty Laptop Training program, implementation of a pilot instructional MOO, acquisition of a site license for CBT Systems products and initiation of the UA on-line training program. By year's end, two strategic modifications had been achieved as well. The core membership was again expanded to include the UA Extended University, and a new name--The Learning Technologies Partnership--was adopted to reflect our changing nature.

Year five is now underway. The structure of the Partnership has changed, as has the make up of the representatives group. Now, in addition to a Faculty Associate, a librarian, two managers, and two "directors" we also include two associate deans within our ranks. Three of us have key players from the start and might be considered the "hard core" element of the Partnership; but no matter the length of association, all members of this group have grown through their involvement. The Partnership is realigning. A new vision and mission statement are being formulated in line with a new strategic goal to advance beyond the "doing" level, to become a policy-making and advisory body. Budgetary control is returning to the Partnership, and strategies are developing in our current deliberations that will determine how we continue to expand our role at the University of Arizona and beyond.

Accomplishments

Each Partnership unit can rightly claim to have advanced faculty and student well-being through new resources and services offered by the unit. For example:

- Librarians regularly collaborate with faculty as co-developers of course web sites and in the classroom teaching information and internet literacy;
- CCIT has expanded the availability and improved the quality of lab resources and begun to transition some open access labs to serve as dedicated electronic classrooms;
- UTC has designed robust training opportunities and governed a campus renovation project resulting in over 100 modern teaching environments;
- VideoServices has acquired the technology needed to enter the high definition TV era;
- The Treistman Center has expanded digital media lab capabilities and established a digital arts degree program;
- Extended University has developed a comprehensive IT training and development curriculum; and
- The Faculty Associate for Distributed Learning is implementing an approach to distance learning that utilizes broad faculty involvement and capitalizes on the concept of shareable learning objects.

Individual unit achievement has been notable, but it is because the Learning Technologies Partnership fostered collaborative relationships and common goals among the units that results like the following have been achieved.

- Approximately 100 faculty have completed intensive training in the use of laptop computers, application software and university facilities preparing them to develop new course materials and innovative classroom presentations.
- These faculty and hundreds of others have found support for innovative redesign of their course content and delivery methods;
- Online instructional support tools, e.g., POLIS, RIO and WILBUR, have been developed to meet

UA specific instructional and instructional assessment needs;
- Oversight of an annual grants program insures ongoing commitment to individual and collaborative faculty development;
- Inter-unit planning for hardware and software acquisitions insures interoperability from production centers, to labs, to Library Info Commons;
- Investments are optimized through shared use of costly equipment;
- Expert staff in all units know each other well and can more efficiently recommend appropriate support for new development efforts;
- New tools have been acquired for campus wide use (e.g., CBT training);
- New learning environments, as exemplified by the UA MOO, are adding new dimensions to old curriculum.
- Partnership representatives are broadly knowledgeable about the UA environment and are easily able to assemble project teams that support faculty innovations and promote enterprise-wide advancement; and
- A "systems" mentality has taken hold so that no one unit completely "owns" the process or the outcome of an undertaking.

Institutional progress can only be measured by assessing change over several years. Using 1995 as a base year, significant advances can be seen. The infrastructure that supports teaching and learning has grown extensively. All campus buildings are connected to the network. Residence halls provide network access on a port-per-pillow basis. Dozens more classrooms and labs are equipped to facilitate dynamic teaching and learning. The UAInfo and SABIO web sites provide extensive and organized access to vast information repositories. Central and departmental instructional technology resources have become more and more integrated. Learning technologies are expected to be readily available by a majority of instructors and dismissed as unnecessary by very few. The campus conversation about instructional innovation has moved beyond debating the usefulness of technology, and instead centers on developing strategies for managing and sharing academic data and ways to assess the impact of different instructional methodologies.

Opportunities

As the 21st century beckons, the growing number of alternatives to traditional ways challenges all levels of education. The University of Arizona is preparing to meet the anticipated challenges. Several new initiatives and major projects are defining the University's approach and the Learning Technologies Partnership brings a unique brand of involvement to each. Some of these high profile ventures include:

- The digital library initiative that will increase the availability and interoperability of all kinds of discipline specific materials (text, graphics, multimedia) through a common portal.
- A pilot project investigating how to deliver digital video services in all possible formats, from real-time multicast and streaming video on demand, to digital video editing at the students' desktops.
- The Virtual Adaptive Learning Architecture (VALA) development project--a collaboration with Oracle Corporation, Sun Microsystems, and the FIPSE Learning Anytime Anywhere initiative.
- Investments in site license software, most notably Oracle products, provide common software tools and storage systems to build a broad based and highly integrated information environment.
- New alliances with local community colleges to create new curricula and programs that meet real world needs of the "new traditional student".
- The Integrated Learning Center, UA's state of the art classroom building, set to open in Fall 2001 and designed to support technology facilitated learning and the freshman experience.

Our most challenging and potentially most rewarding opportunity lies in becoming a recognized *partnership of leaders* that can influence and nurture the development of other virtual organizations, thereby creating a more flexible university system that in turn better prepares the UA to meet the unexpected challenges that lie ahead.

Lessons Learned

The Learning Technologies Partnership has successfully demonstrated the value of active sustained collaboration; having created through its work a virtual organization that positively impacts all parts of the university. Our success was founded on several key ingredients. First, visionary leadership: at the onset our Vice Provost and our faculty champion both understood the fundamental need to accept and apply technology in teaching and learning and both believed in the potential of a new and different kind of university structure. Second, open minded, credible, key collaborators: in our case unit managers and team leaders who are able to direct university resources to solve problems. Third, willing staff who are eager to work with and support peer colleagues from "unrelated" units. Fourth, a shared budget that enables interdepartmental decision-making and shared outcomes.

Success would not be sustainable, however, without other ingredients that are more nebulous in nature. Patience is one of the most important core values of our virtual organization. The ability to exercise patient understanding of the university bureaucracy helps us maintain firm commitment to new "ways of being". Championship is another key to ongoing success. The risk of losing everything during high-level leadership transitions is significant without at least one vocal administrative champion. Communication revolving around open-minded idea sharing is the real key to progress and innovation. Community spirit provides the means to address all problems. Behaving as responsible community members allows individuals to challenge and to nurture each other. Finally we must acknowledge a "secret" ingredient--Passion. It is true passionate commitment that has infused our virtual organization with real strength to stay true to the shared vision and, despite change and uncertainty, to have fun through it all.

Conclusion--Why do it?

Creating a virtual organization such as the one achieved through the University of Arizona's Learning Technologies Partnership can have many benefits. Cost effective use of resources, better service to "customers", greater awareness of the environment, and more efficient decision-making are some obvious benefits. Our experience suggests another, more compelling reason as well. Through our virtual organization we have created a real mechanism and a rational means to bring separated resources (personnel, technologies, knowledge) together so that new, more creative and dynamic results can be achieved on a continuing and more self-sustaining basis.

EDUCAUSE **Information Resources Library**

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Abstract

Category: Papers Presented at EDUCAUSE annual conferences

ID Number:	EDU9923
Title:	TexShare: A Texas Library Resource Sharing Program
Author:	Deborah Littrell, Susan K. Phillips, Tommie J. Wingfield
Organization:	Texas State Library & Archives Commission, University of Texas
Year:	1999
Abstract:	TexShare is the state-funded, resource-sharing consortium of more than 170 community organizations, public and private colleges and universities, and medical and law schools and public libraries in Texas. TexShare services include consortial purchasing of electronic databases, centralized technical management of databases, the TexShare card for statewide borrowing privileges, and the TExpress Courier Service and TexTreasures. This paper covers planning and strategy, management/organization, technical infrastructure, and service delivery for TexShare.

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TexShare: A Texas Library Resource Sharing Program

TexShare, the statewide library resource sharing program in Texas, now encompasses 650 public and academic libraries throughout the state. Initiated in 1993 as a program of the Texas Higher Education Coordinating Board for the publicly funded academic libraries, the TexShare Library Consortium was enacted in legislation and placed under management of the Texas State Library and Archives Commission in 1997. Community college libraries as well as libraries of independent institutions were added at that time. Public libraries were included in the program during the 1999 legislative session

Throughout its history, the vision of TexShare has been to increase the intellectual productivity of the students, faculty, and general citizenry of the state by sharing information quickly and affordably. Public libraries were included specifically to "improve the educational resources in the community," emphasizing the continuing focus on education.

The goal is to provide services that enable each library to better meet its unique mission. From the smallest and largest public libraries to the most specialized medical centers to our prestigious private universities, each can benefit from the information and programs of TexShare. Woven together, the TexShare programs form the infrastructure upon which we are building library services for distance learners as well as for traditional learners - serving all of our institutions.

TexShare has been a member-driven program from the outset, guided by the following principles:* participation in all TexShare programs is at the option of the individual library* many opportunities for grassroots participation in working groups must be available* strong contributions from both the largest and smallest libraries are essential to the success of the program, and* member libraries should pay a modest fee for many programs.Thus, the program is true to its Texas roots of independence and practicality.

History/Strategy/PlanningSue Phillips

From its inception in 1993 as a library resource sharing program for publicly-funded four-year academic and medical institutions of higher education in the state of Texas, the very success of TexShare has brought about a continuing evolution of the program. Over the past seven years, program oversight has been vested in two state agencies, program management has been shared among five separate organizations, and membership has increased from 50 to 650 libraries.

Planning, both strategic and programmatic, has been a strong component of TexShare. An initial year-long planning process provided opportunities for each TexShare library to voice their opinions on programs and services through focus groups, site visits, and writtencomments. Using the results of the planning process as a basis for the TexShare program, the Texas Higher Education Coordinating Board awarded successive TexShare management contracts to Texas A&M University / University of Houston and later to a partnership of the University of Texas at Austin and Amigos Library Services.

The need for a stable home for the business relationships inherent in library resource sharing programs led in 1997 to the establishment of TexShare as a program of the Texas State Library and Archives Commission. A subsequent round of strategic planning sessions in early 1998 resulted in the initiative to include public libraries in the TexShare membership. Legislative action in 1999 accomplished that goal. A recommendation has been made for a TexShare 2000 strategic planning effort to set the directions for the next phase of this unique program serving all the citizens of the state through 650 libraries.

Organization and ManagementDeborah Littrell

TexShare is a cooperative program designed to improve library services to Texans, and to help member libraries fulfill their unique missions. It is a program of the Texas State Library and Archives Commission. There are many parties instrumental to the success of TexShare. Formally, responsibility for TexShare, as for all State Library programs, lies with the State Library Commission and the State Librarian. The TexShare Roles and Responsibilities Statement includes the following additional partners: State Library staff, Chair of the TexShare Advisory Board, TexShare Advisory Board, Working Groups, TexShare Member Institutions, Strategic Partners.

Historically TexShare has been a member driven organization. It began as an initiative of the publicly funded academic institutions in Texas (funded in 1994 under the Texas Higher Education Coordinating Board), and grew to include private academic institutions and community colleges (1997). During this period member institutions and Amigos managed TexShare under contract to the THECB. In 1997 responsibility for TexShare was moved to the State Library. The University of Texas at Austin continued its role of providing technical support and Amigos continued to provide administrative support. In 1999 the Library Resource Sharing division of the State Library was fully staffed and began assuming full administrative responsibility. As of September 1, 1999, public libraries are also TexShare members.

History/Strategy/PlanningSue Phillips

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Programs / ServicesTommie Wingfield

TexShare provides a variety of programs and services to members libraries. Following is a summary of the programs supported and managed by TexShare working groups and strategic partners:

TexShare Card Working Group Patrons from participating TexShare libraries can borrow materials on-site, directly from other TexShare libraries. Schools of Medicine and Law may choose to limit loans to graduate students and faculty of participating TexShare libraries. Last year 75% of the TexShare libraries participated, issuing 18, 816 cards and loaning 51,842 books.

Courier Service Working Group TExpress Courier Service: TexShare libraries can benefit from a state-wide courier service at very favorable pricing. Deliveries are only to/from participating TexShare libraries. Participation is optional for the five-day service. TExpress has over 100 members. From January to August 1999, libraries sent 88,294items by courier.

Education Working Group TexShare provided training through the Texas State Library for technicians of libraries' technical infrastructure, an introduction to TexShare services for administrators of new members, training in the use of the Ovid interface for public services librarians, and training based on member needs.

Electronic Information Working Group TexShare combines the buying power of its members to obtain affordable access to electronic indexes and full-text articles. There are two tiers of databases: Core – 75% subsidized by TexShare – and TexShare Select – optional, unsubsidized, and using group purchasing power to cut costs. The databases are managed by technical staff at the UT Austin Library.

InterLibrary Loan Protocol Working Group TexShare libraries assist each other by agreeing to provide requested materials free to each other's patrons through interlibrary loan. This Group publishes the TexShare ILL protocol and individual library policies on the TexShare Web, promotes the use of Ariel document transmission stations, and maintains the LOANSTAR listserve. Between September 1998 and June 1999, 144,588 loans were process by TexShare libraries.

Texas Collections Working Group Through the TexTreasures grant program TexShare assists libraries in converting information to digital formats and in creating electronic information about special or unique collections making access to new electronic content available to researchers across the state. Projects funded included processing the archives of *Texas Monthly* magazine, transcribing oral histories, and cataloging early Texas maps. The available pool last year was $100,000 and the maximum grant was $20,000.

Technology Platform The University of Texas at Austin, under contract with the TSLAC, procures, manages, and provides technical support for a hardware/software platform that supports locally loaded content (licensed from information vendors) and the TexShare Website. Staff at UT Austin also assist in the selection and procurement of the licensed information content made available to Texshare members institutions.

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Abstract

Category: Papers Presented at EDUCAUSE annual conferences

ID Number: EDU9941

Title: The Catalyst Project: Supporting Faculty Uses of the Web...with the Web

Author: Mark Donovan, Scott Macklin

Organization: University of Washington

Year: 1999

Abstract: Since 1994 UWired, a collaborative unit at the University of Washington, has worked to develop and improve ways to support faculty teaching with new technologies. In 1998 UWired initiated a series of activities aimed at reinventing its support structure and redefining the role of the university's Center for Teaching, Learning, and Technology. In early 1999 UWired launched the Catalyst project, the most visible manifestation of its new approach. This article details the strategic plan behind the Catalyst project and the redefinition of the center.

This EDUCAUSE '99 presentation was based on an article in CAUSE/EFFECT Volume 22 Number 3 1999.

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The Catalyst Project: Supporting Faculty Uses of the Web...with the Web

by Mark Donovan and Scott Macklin

Since 1994 ***UWired****, a collaborative unit at the* ***University of Washington****, has worked to develop and improve ways to support faculty teaching with new technologies. In 1998 UWired initiated a series of activities aimed at reinventing its support structure and redefining the role of the university's* ***Center for Teaching, Learning, and Technology****. In early 1999 UWired launched the* ***Catalyst project****, the most visible manifestation of its new approach. This article details the strategic plan behind the Catalyst project and the redefinition of the center.*

Finding ways to effectively support teaching with new technologies has been a vexing problem for colleges and universities. A variety of strategies have been advocated for engaging faculty and providing faculty support and training, and many articles on the topic published in practitioner journals include laundry lists of strategies to motivate, incentivize, train, and otherwise cajole faculty into integrating technology into their teaching.

It is clear that institutional contexts and culture, not to mention the underlying technological infrastructure, have a profound influence on the effectiveness of faculty support and development strategies. It is also clear that there are real barriers to faculty adoption of instructional technology, including concerns about intellectual property, the disconnect between innovation in teaching and tenure decisions and disciplinary rewards, and the preeminence of research activity at some institutions. In addition, there is a segment of the faculty (a diminishing minority, we will argue) that is uninterested and even hostile to technology.

The difficulties inherent in promoting and supporting good instructional uses of technology can be paralyzing. Yet the risk is not so much that faculty support staff will be paralyzed, but rather that we will become so attuned to our current difficulties that we will fail to understand fully the transformative effect of the technologies we promote and support, and thus will be left trying hard to solve yesterday's problem.

In the earlier years of the Web, say 12 to 36 months ago, many campuses responded to the challenges of instructional technology support by establishing campus centers for teaching, learning, and technology. These centers typically host workshops and training, organize recurring "show and tell" conferences, provide one-on-one consulting with educational technologists and instructional designers, convene faculty "brown bag" sessions, and often initiate mini-grant competitions designed to provide extended (often expensive) support for particular faculty projects. These centers typically work with a small percentage of highly motivated faculty.

But what about the rest? In conversations with colleagues we have heard those faculty members who don't participate in such activities labeled "disinterested," "hard to reach," "resistant," and--the put-down of last resort--"luddites." In a recent article entitled "'Where Are They?': Why Technology Education for Teachers Can Be So Difficult," Claudia Rebaza laments the declining turnout at her institution's instructional technology conferences.[1] She ultimately concludes:

> The problem in motivating faculty to learn about new teaching methods is difficult regardless of whether or not technology is involved. . . . No matter how many learning opportunities you offer--lectures, hands-on workshops, handouts, classes, computer tutorials, media guides--what people really will find most helpful is a one-on-one approach, with instruction at the point of need. As demand for "convenience learning" continues to grow, it may be that competitive pressures and a healthy respect for the bottom line will achieve the faculty cooperation no other motivation can bring.

We think she gets this equation half right--and backwards. "Instruction at the point of need" is a crucial concept. Will institutional demands to provide "convenience learning" result in faculty being forced to adopt technology? Perhaps. But it could also be that the increasing ubiquity of networked information technologies will result in faculty themselves seeking out convenient, just-in-time learning to support their efforts to use technology.

This, we think, is a crucial point: While early adopters sought out personal assistance and allies to support them in what have often been contrarian activities, we believe the next wave of faculty adopters will be more interested in finding support and assistance via the Web. UWired has worked over the past year and half to turn this hypothesis into a robust program for faculty support.

UWired

In 1994 the University of Washington established UWired as a collaborative unit designed to find, develop, promote, and support effective uses of teaching and learning with technology. From the outset, UWired has played an important coordinating role, bringing the collective expertise of its five partners--Computing & Communications, University Libraries, the Office of Undergraduate Education, the Office of Educational Partnerships, and Educational Outreach--to bear on common challenges and opportunities posed by the academic uses of information technology.

With a staff of between five and seven full-time professionals and upwards of 75 students, UWired has functioned as a lean and flexible organization that has primary responsibility for the university's central student computing labs (325 seats) and faculty technology support. In addition, at any given time UWired is involved in supporting up to a dozen programs or initiatives aimed at promoting technology access, information literacy and fluency with information technology, and technology-based innovation in teaching.

The actual capacity and reach of UWired are dependent on the close working relationship developed among the UWired partners and other campus affiliates (such as the Office of Educational Assessment, the College of Arts & Sciences, and the School of Library and Information Science). This collaborative approach reduces the duplication of effort and resources, speeds the identification of new challenges and opportunities, and improves communication between units at a very large and highly distributed university. The importance of this collaboration was never more evident than when UWired began a fundamental rethinking of its faculty support model a little over 18 months ago.

Rethinking faculty support

In 1996 UWired established the Center for Teaching, Learning, and Technology to provide front-line support for faculty who wished to experiment with new technologies, not unlike the centers established at other institutions. Workshops, drop-in consulting, and intensive, project-based support were provided free of charge to faculty who sought out assistance. Midway through 1998 we projected 1,700 annual visits to the center, more than double those of the preceding year. Based on that statistic, it seemed that we were doing our job, but a look below the surface suggested that we were not having the impact--or playing the role--that best suited our position.

The majority of the visits to our center were from teaching assistants and "the usual suspects"--faculty with whom UWired had established a relationship, often on the basis of a project we supported under a mini-grant initiative. While the use of our facility was on the increase, we saw no evidence that the reach of our support had likewise been extended. We found ourselves grappling with a question common these days to those in faculty support roles--how to reach beyond the early adopters? By talking with faculty, meeting with college and department heads, and conducting faculty focus groups, we began to understand that, as technology use spread beyond the early adopters to the pragmatists who largely composed the university community, our strategy for supporting faculty would also have to change.

The early adopters who sought out our center were willing to make the trek across campus from their office and often seemed in search of allies as much as they were in search of technical assistance. As faculty use of technology becomes the norm, we find the pragmatists far more interested in finding just-in-time support than in finding like-minded supporters. Furthermore, our vision of the center as a place where faculty could drop in and work required that we configure the center like a drop-in lab with each workstation configured with a standard set of tools. As Web technologies have grown more diverse and complex, this need to provide standard tools conflicted with the need to experiment with hardware and software and the diverse technology solutions that were taking hold in various colleges and departments.

Faculty support in a multi-tiered system

As we rethought our role in supporting faculty uses of instructional technology, we found ourselves pinched between the needs of faculty to make use of the centrally supported university IT infrastructure and the particularities of their college or departmental environment. This tension hinted at the direction of our reinvention--we needed to translate the central infrastructure and find ways to provide common support that did not conflict with the idiosyncrasies of the local computing environment. As we discuss in detail below, *providing educationally focused, flexible support via the Web became the cornerstone* of our strategy.

The foundation for instructional technology at the University of Washington is the vast, robust network infrastructure developed and maintained by Computing & Communications (C&C). The heavily used network involves ubiquitous Ethernet connectivity and transfers an average of more than 1 million e-mail messages and 700 gigabytes of data each day. C&C hosts more than 70,000 user accounts and nearly 18,000 Web sites for individuals and organizations on campus. C&C's enterprise computing model is centered on providing a standards-based infrastructure that allows units within the university to build and deploy the kinds of applications that fit their specific needs.

Because of this multi-tiered architecture, the local computing environment of the faculty varies greatly owing to different needs, cultures, and decision-making processes at the college and department level. For example, some colleges and departments have adopted standard Web authoring tools (such as **Macromedia's *Dreamweaver*** or **Microsoft's *FrontPage***) while others have implemented courseware solutions (such as ***WebCT*** or **Blackboard's *CourseInfo***). Rather than try to promote a campus standard for such tools, we recognized that differences in unit needs and capacity were driving this diversity. Furthermore, we believed that there was a great potential that this diversity of approaches would lead to accelerated experimentation, innovation, and learning about the effective uses of technology in teaching.

Our appreciation for the diversity of college and departmental needs also led to encounters with those staff members responsible for supporting faculty uses of technology within academic departments. We discovered a general ambivalence to the existence of UWired and the Center for Teaching, Learning, and Technology that was seen as a place where some faculty went to receive help. For the most part, our activities did nothing to add value to the work of these departmental staffers since we typically worked with the eager early adopters and the department staff were often left working with those pragmatic faculty who, while interested in using technology, were not interested in straying too far from their office to learn.

Departmental technology staff are a diverse lot, running the gamut from trained technologists to graduate students working for a stipend. Many are staff members hired for another role who, by virtue of their technical skills and ability to work with faculty, end up supporting technology at the desktop, replacing hard drives, and assisting faculty with course Web pages. Many of these departmental support staff spend considerable energies developing materials to tutor faculty on instructional uses of technology. In rare cases they were also assisting faculty in the creation of Web-based instructional software. It was clear to us that there was an excellent opportunity for UWired to invent an effort which would bridge the gap between a world-class network infrastructure and the academic departments where the bulk of the instructional work was being done.

Our strategy was also based on a belief that the penetration of information technology is changing faculty work habits and expectations in ways that are not yet being fully appreciated. It is common for those of us supporting academic computing to argue at once that networked technologies drive individual and social change, yet faculty are somehow inoculated from these changes and will not get up to speed with technology without our intervention and assistance and a healthy (though rarely forthcoming) set of rewards and incentives. This argument for "academic exceptionalism"--one we have at times promoted--ignores the ways that network technologies pervade the lives of faculty in their roles as citizen, researcher, and hobbyist. While it is true that there is much work to be done to couple innovation in teaching with the rewards of the tenure system, we believe that this articulation will follow, not precede, the diffusion of technology in teaching. In Washington, a state in which the software industry holds the largest payroll and which boasts the third largest percentage of home computer ownership and households online, our intuition was that information technologies, specifically e-mail and the Web, were already becoming deeply ingrained in the life of our faculty.

Through our partnership with the University Libraries, UWired included measures of faculty technology use in the Libraries' 1998 triennial user survey.[2] What we found confirmed our intuition and helped to clarify our strategy. Of the faculty surveyed (N=1,503), 84 percent responded that the Web was very important for their work, 91 percent reported using e-mail to communicate with students, and 31 percent reported putting course material (beyond a simple syllabus) on the Web. The picture that emerged from this survey was of a faculty already deeply committed to using the technologies we were working to support. As we thought about how to reposition UWired's faculty support efforts to fulfill the role of translator and coordinator of information about technology in teaching and learning, it became clear to us that the challenge was that of supporting instructional uses of technology through these same technologies.

The Catalyst project

The Catalyst project, which emerged from this period of examination and reflection, is based on the following assumptions:

- faculty want just-in-time learning and support,
- they prefer to do this learning at their own pace, in their local environment,
- the Web is or will become the vehicle of choice for just-in-time information and learning,
- distributed support personnel are best suited to make the critical decisions about local infrastructure and local support, and
- the key function for UWired--the value add--is in capturing, focusing, and disseminating the ideas, resources, and tools that allow both faculty members and local support personnel to make innovative use of new technologies in teaching and learning with a minimum of duplicative effort.

While distributing FAQs and how-to materials via the Web is a standard practice of academic computing groups, there is a significant difference between simply posting information and creating a comfortable, useful Web-based environment that meets the needs of a diverse set of faculty. We sought to create an easily navigable clearinghouse for information on the use of the Web in teaching and learning and also hoped that the site would become a catch basin for the many scattered but impressive technology efforts on campus. By creating a site that would meet faculty needs and draw repeat visits, we hoped to create a center of gravity for innovation in teaching with technology that would far exceed the reach of our physical Center for Teaching, Learning, and Technology.

We have previously described in detail the development of the Catalyst site.[3] The site consists of four basic types of content:

1. *Profiles* of educators and programs that provide a vehicle to share ideas and experience, humanize the use of technology, and hopefully diffuse innovations.

2. *Guides* to instructional methods and technology tasks that present material in a familiar framework and provide a map to a wide range of individual documents.

3. *Dynamic content* providing frequently updated information on news and events relevant to teaching with technology.

4. *Instructional tools* that provide a standard mechanism for faculty to create interactive, Web-based instructional modules using only a Web browser. Because we do not distribute software, our model is actually that of providing a *Web-based service*.

We were determined at the outset to create a Web property that would be immediately useful and intuitive to navigate. We understood that attempts to provide "good information" would fall flat if end users were unable to find the information they needed or otherwise experienced frustration with the site. Key to achieving this goal was the work of our information designer who created a clean, intuitive look and feel for the site, an aspect of Catalyst that has been widely praised by faculty.

The site is built on a simple, tested architecture that relies on a limited number of icons, a clear color scheme to categorize content, and a standard page layout that makes it easy for users to navigate and quickly scan for useful information. The site relies on small graphical elements that speed viewing over a slow connection, and the pages of the site have been designed to easily print out for those who prefer reading from paper rather than the screen. Our how-to guides (Quick Guides) are each centered on a particular task and map each task on a standard four-part framework:

Plan › Create › Connect › Reflect.

In addition to creating a helpful resource, we wanted to create something that would in a sense become "public property," by encouraging others outside of UWired to contribute to its development. To facilitate this, we consciously attempted to create a new brand identity for the university's educational technology efforts. We deemed this important for three reasons. First, a new, identifiable brand focuses educators on a single, stable source of information and resources, providing new opportunities to coordinate information and resources and creating the critical mass for ideas that might otherwise be overlooked. Second, the new identity creates a sense of newness and opportunity, "wiping the slate clean" of previous, perhaps negative, associations of technology and technology support. Finally, the new brand creates opportunities for partnerships and collaboration by emphasizing UWired's *coordinating role* while de-emphasizing any (false) sense that UWired *controlled* these activities.

Our desire to use Catalyst to leverage the work of others is just picking up steam, but our initial experience has been encouraging. Departments and college support personnel who have developed materials specific to their local computing environments--for instance, how-to documents on a particular Web editor--have been eager to see their work repackaged and made available to a much larger audience. While we generally favor off-the-shelf solutions over homegrown ones, our Web service model allows us to make specialized Web-based instructional tools widely available. When we identify promising "one off" efforts developed by faculty, we are able to work with these faculty to redesign their tools so that they are secure, scalable, and available to the campus community as a Web-based service.

A new role for the Center for Teaching, Learning, and Technology

To develop and launch Catalyst on a shoestring, we had to commit our staff resources at the Center for Teaching, Learning, and Technology to the development of Web content. As we did this, we began to understand that the continued evolution and improvement of Catalyst would require a reorganization of our staff and the activities of the center to support this effort. This realization necessitated some hard choices. It meant de-emphasizing the primacy of our self-perceived role of providing in-person support to the faculty while having faith that our greatest impact lay in providing timely and accurate information to the faculty we never saw, those who used Catalyst at their desktop. We also curtailed our workshop schedule and focused on preparing workshop materials that, like the other components of Catalyst, could be distributed and used by others.

Figure 1 documents the changes in the organization and operation of the Center for Teaching, Learning, and Technology that were initiated to support the Catalyst project. In many cases the changes have been invisible to our clients--they still receive the one-to-one assistance many request, but our orientation has shifted away from viewing this as the activity with the largest impact. In fact, as we transitioned into becoming "an RD&D space" (research, development, and demonstration), the energy of our operations increased markedly, and our clients have responded positively. Though a few have complained about the increased noise and activity in our relatively small space (a medium-sized common room with 14 computers, scanners, and printers and two connected offices for developers and consultants), others have clearly enjoyed working in a frenetic, often exciting, environment. Our clients understand that our work is oriented completely around serving faculty, and the fact that this work is visible and not hidden in a back room seems to stimulate their interest and support. On more than one occasion faculty clients have been brought in and contributed to the "whiteboard sessions" that are a frequent part of our operations. While we initially had concerns about how our existing clients would view this reorientation, these were largely unfounded.

Figure 1: Reorganizing the UWired Center

Old	New
Drop-in center where faculty could work and receive one-to-one assistance	Research, development, and demonstration center where Catalyst tools and content are developed and where faculty can drop in and experiment with a range of technology solutions
Standard software and hardware to provide a uniform and familiar environment for frequent clients	Highly variegated computing environment where faculty can find a configuration that matches their office environment or test new tools
Custom solutions tailored to faculty needs, often requiring significant staff time and creating the expectation of continued, intensive support	Common solutions that address the most frequently expressed needs, customizable by faculty themselves
Intensive support for the relatively few physical clients	Baseline support for many virtual clients
Frequent drop-in workshops	Fewer general access workshops, more department-specific workshops
People-centered service aimed at making clients comfortable using the center	People-centered service aimed at empowering clients to use technology wherever they are most comfortable

The ongoing development of Catalyst has been made possible by organizing our staff into content teams that work on different components of the site. These teams, comprised of graduate assistants and undergraduate student staff, work within an established development process and make use of a project-tracking database to facilitate the coordination and handoff of projects among staff who work almost exclusively part-time. The Catalyst team uses the technologies we support to do their work, using for example, off-the-sheif Web products to develop new content and using our Web-based peer review tool to critique and edit proposed content and design changes. The result is that the staff quickly become fluent with the technologies we need to support, and as a result of their daily work they often suggest improvements that are ultimately incorporated into technologies made available to our clients.

Our development activity has shifted from a focus on highly customized, boutique solutions that met the need of particular educators--but did not scale--to the development of a modular Web-based suite of services that meet common needs identified through discussions with a wide range of educators. For example, the peer review tool mentioned above was developed in close coordination with campus writing labs. Because it addressed a widely shared need and could be tailored to a specific instructional practice, we thought it warranted the expense of creating a tool (again, really a *service*) that would be available to the campus at large with accompanying how-to documentation and suggestions for its instructional use. Fundamentally, our goal has shifted from trying to meet the idiosyncratic needs of the individual educator to that of attempting to meet enterprise-wide educational needs.

Feedback loops and ongoing development

The Catalyst site was launched in February 1999, and the reception both on campus and off has been better than we hoped.[4] Hundreds of educators have made use of the site and in the first six months of operation--which was purposely marked by little more publicity than a flyer sent to all faculty--our Web tools have been implemented nearly 1,400 times by faculty creating materials for their students.[5] The site has been used by faculty from Anesthesiology to Urban Horticulture (we need to work on the folks in Zoology) at each of three campuses of the University of Washington.

We well understand, though, that many a Web site has made an initial splash only to be quickly relegated to memory or an unused browser bookmark. Working from the standpoint that people use the Web with tasks and goals in mind, we have paid considerable attention to user feedback and usability testing and are continually working to improve the design of the site and its offerings. Through a partnership with the Department of Technical Communications, we initiated usability testing immediately after the site launched.[6] We found several areas in need of improvement and immediately went to work to address them. The Catalyst Web site you will find today is thus significantly different from the one that existed just a few months ago. This first round of changes--we anticipate that the site will continually change--included:

- adding search functionality,
- giving access to the search engine and glossary directly from the standard navigation bar,
- eliminating the drop-down menus which were the primary form of site navigation (experienced users liked these, but novice users were confused), and
- adding contextual rollovers to orient users better to the Catalyst content categories.

The formal usability test was not our only means of soliciting feedback. We placed feedback forms throughout the Web site and conducted impromptu needs assessment with educators as they utilized the resources of the Center for Teaching, Learning, and Technology. In addition, we implemented Web cookies and mechanisms to compile site statistics to help us gather more information about our users and their usage patterns of Catalyst. We intended to use these data to improve the site navigation and the placement and promotion of information that is popular and information that we know to be useful but that users may have a difficult time noticing.

Our goal was not just to create a helpful set of resources, but also to create a site that would draw repeat visits and over time would be viewed as the first place campus educators would look for information about teaching with technology. In the parlance of e-commerce, we wanted to make the site "sticky." Our original design was so focused on making the site useful that we neglected to make the site timely. The current, redesigned site includes four categories of dynamic content which change often and are intended to make Catalyst a site that educators visit frequently:

1. *News & Reviews* contains announcements and reports from conferences, software reviews, and articles about technology on the horizon.

2. *Tips & Tricks* contains technical short-cuts, mini how-to documents, resources for hands-on work, e.g., printing frames, pointer to Adobe's free online tutorials, changing image size for printing in PhotoShop, or creating a table of contents in Microsoft Word.

3. *Events* contains an ongoing calendar of events about teaching with technology.

4. *What's New on Catalyst* provides an opportunity to highlight recent additions to the Catalyst Web site.

The addition of this dynamic content makes Catalyst more than a (seemingly) static collection of information and provides a vehicle for UWired and others to disseminate information and opinions quickly to the community of educators that we serve. In addition to these changes, our development queue contains several new Web services that meet commonly expressed demands and instructional challenges, including a small-group learning environment tool based on a successful "virtual clinic" experiment in the School of Medicine with broad applications for problem-based learning. Like our other development projects, this tool is being developed in conjunction with educators and assessment experts and upon release will be accompanied by a suite of instructional and technical documentation.

Concluding thoughts

Like all of UWired's activities, we view Catalyst as an evolving experiment. Our overarching goal is to create a useful and positive user experience that will translate into innovative uses of technology in teaching and learning.[7] The rapidity of technological (and social) change being wrought by new information technologies has prompted us to look outside the university for insight on how best to organize our operations and develop a Web property that provides leading edge services and support for educators. We have tried to mirror the best practices of Web companies by moving quickly and remaining flexible and responsive in the face of changing needs and opportunities.

Our belief that faculty will increasingly look to the Web for the support they need prompted a fundamental reorganization of our operations that so far appears to be paying off. In just over six months we have completed both the initial launch of the site and significant redesign and have found the reach and impact of this virtual center for teaching, learning, and technology to have exceeded that of our three-year-old physical center. We are connecting with the pragmatists who represent the majority of faculty and not just the early adopters in search of allies.

We recognize that this strategy may not be universally applicable. Catalyst makes sense as a support strategy at our university largely because of the very high penetration of networked technologies, the robust networking infrastructure, and distributed support systems that were already in place, though not yet well connected with each other. Institutions considering a similar strategy would do well to consider these factors in light of their own context and might consider a Catalyst-like set of resources and services to be a second-generation strategy. Having said that, the speed at which the Web and other networked technologies have entered our lives suggests that institutions should think hard about how best to allocate central support resources. The risk in focusing too much on existing support models is that institutions may not be well positioned to address coming challenges.

Endnotes

1 Claudia Rebaza, "'Where Are They?': Why Technology Education for Teachers Can Be So Difficult," *Technology Source*, June 1998 [**http://horizon.unc.edu/TS/vision/1998-06.asp**].

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2 See **http://www.lib.washington.edu/surveys/** for the 1998 survey data and for presentations on this project presented by Lizabeth Wilson, associate director of UW Libraries, and Steve Hiller, head of Science Libraries, for the April 1999 ACRL pre-conference seminar, "Assessing the Academic Networked Environment."

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3 See our CAUSE98 paper, "One Size Doesn't Fit All: Designing Scaleable, Client-Centered Support for Technology in Teaching" at **http://www.educause.edu/ir/library/html/cnc9846/cnc9846.html**, or the condensed version presented as "Supporting Technology in Teaching and Learning: One Size Doesn't Fit All," in *Planning for Higher Education*, Fall 1999.

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4 The site is viewable to the world at **http://depts.washington.edu/catalyst/home.html**. Currently the Web services are restricted to members of the University of Washington community.

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5 Taking a cue from the restaurant industry, we planned for a "soft launch" of the site in order to ensure that our organizational capacity could keep up with what we hoped would be interest in the site. It did, but just barely, and much of the past summer was taken up with improving operations and making arrangements to ensure that we can handle the feedback and support demands that we expect with the publicity blitz planned for the next academic year.

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6 While we had done extensive informal testing of the site architecture, design, and content prior to the public launch that had a dramatic influence on the site, we were unable to complete formal usability testing and meet our launch deadline. When working "on Internet time," there is a very real tension been "good enough" and "just right."

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7 We think and talk in terms of promoting "innovation in teaching and learning" rather than "integrating technology in teaching." The usefulness of this perspective is discussed in Mark Donovan, "Rethinking Faculty Support," *Technology Source*, September/October 1999 [**http://horizon.unc.edu/TS/development/1999-09.asp**].

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Transforming Education Through Information Technologies

Abstract

Category: Papers Presented at EDUCAUSE annual conferences

ID Number:	E J9949
Title:	The Internet: New Engine of Inequality?
Author:	Lawrence E. Gladieux, Watson Scott Swail
Organization:	The College Board
Year:	1999

Abstract:

The authors review recent developments in information technology and distance learning, and how they combine with economic forces to fuel a global market for higher education. The paper focuses particularly on the question of access: Will the "virtual university" expand opportunities for those who have traditionally been underrepresented in higher education? The Internet shatters barriers of time and space, but emerging technologies may, in fact, deepen the divide between the educational haves and have-nots, and the marketplace alone will not fix the problem. Public policy must intervene to narrow the "digital divide" between whites and minorities, the wealthy and less advantaged.

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The Internet: New Engine of Inequality?

By

Lawrence E. Gladieux and Watson Scott Swail
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Washington, DC

Abstract

We review recent developments in information technology and distance learning, and how they combine with economic forces to fuel a global market for higher education. The paper focuses particularly on the question of access: Will the "virtual university" expand opportunities for those who have traditionally been underrepresented in higher education? The Internet shatters barriers of time and space, but emerging technologies may, in fact, deepen the divide between the educational haves and have-nots, and the marketplace alone will not fix the problem. Public policy must intervene to narrow the "digital divide between whites and minorities, the wealthy and less advantaged.

(The authors provide a more detailed analysis of these issues in "The Virtual University and Educational Opportunity: Issues of Equity and Access for the Next Generation," published by the College Board and available for download from http://www.collegeboard.org.)

A burgeoning computer market and the advent of the Internet and World Wide Web have sparked a rapid increase in the electronic delivery of higher education. The vision of students collecting certificates or degrees without ever setting foot in a classroom has captured the imagination of education entrepreneurs and Wall Street investors.

But are students in fact flocking to online educational opportunities? The U.S. Department of Education reports that three quarters of a million U.S. students enrolled in more than 15,000 distance education courses in 1995 (U.S. Department of Education, 1997). This estimate, however, includes all forms of distance education, not just online learning, and even such an inclusive estimate does not amount to a significant proportion of postsecondary enrollments.

The truth is we have very little information on how many students or employees are actually making use of online course offerings, and we know less about their characteristics. Without such information we have no way of knowing whether virtual technology is reaching those who might not otherwise have access to higher education, or simply accommodating those who already take advantage of other educational opportunities.

There is no doubt that the World Wide Web shatters barriers of time and space in the delivery of instruction. But its advent is also likely to create new barriers and inequities, simply because of the differential availability of the required technology. Virtual universities will only help those who have the necessary equipment and experience to be comfortable with the technologies.

Computers may seem ubiquitous in today's society, but their distribution is highly stratified by income, race/ethnicity, and educational attainment. For instance, three-quarters of households with incomes over $75,000 have a computer, compared to one-third of households with incomes between $25,000 and $35,000, and one-sixth with incomes below $15,000. White households are twice as likely as black and Hispanic households to have access to computers and online services. And those with a B.A. degree or higher are about four times as likely as those with only a high school education to have online service (U.S. Department of Commerce, 1998).

Similarly, not all students have equal access to computers and the Internet at school. In fact, there is evidence that students with the greatest need get the least access. According to a 1997 study by the Educational Testing Service, the ratio of students to computers is highest in schools with the largest proportions of poor and minority students, and the availability of Internet access goes down as the percentage of such students increases (Coley, Cradler, & Engel, 1997).

More recent data from the National Center for Education Statistics indicate progress in closing such gaps and meeting the Clinton administration's goal of connecting every school to the Internet by the year 2000 (NCES, 1999). Almost 90 percent of public schools had access to the Internet in fall 1998, compared to only 35 percent four years earlier. But school access is not a good indicator of student access. In fact, one study suggests that half the schools that are linked to the Internet are connected only at the library/media center or principal's office (Quality Education Data, 1998).

A better indicator of penetration in the schools is percentage of classrooms connected to the Internet. Here the disparities remain significant. About 40 percent of classrooms in schools with the highest concentration of poor students (measured by percentage of students eligible for free or reduced-price lunch) have Internet access, compared to more than 60 percent of classrooms in schools with the lowest concentration of poor students. Similar gaps exist by race/ethnicity (NCES, 1999).

Not surprisingly, differentials in experience with technology show up when students enter postsecondary education. UCLA's Higher Education Research Institute concludes from its most recent annual freshman survey: "Despite the overall high levels of computer and Internet use, not all students enter college with Internet savvy" (Higher Education Research Institute, 1999, p. 1). The survey found that the percentage of students using e-mail varies widely by type of institution, with the greatest use among students enrolling in private universities and the lowest rates among students at public black colleges.

In the final analysis, data probably cannot capture the full story here. While education is the great equalizer, technology appears to be a new engine of inequality. Access to technology is not only about hardware and software. It is about effective use, teacher training, and careful integration of technology into the curriculum. The most advantaged citizens-and schools-are most able to benefit from cutting-edge technologies. Advantage magnifies advantage. Those who use computers on a regular basis are more apt to use them routinely in problem solving and critical thinking. They use computers as past generations used pen and paper. Those with limited computer experience will be handicapped in their ability to access knowledge and avail themselves of the ever increasing variety of learning experiences.

Even when computers are available, technological problems-equipment malf-unctioning, Internet congestion and delay-can interfere with online learning and lead to frustration for students and teachers. Internet users know that ability to "surf" the Web is tied to the speed and reliability of the Internet provider, CPU, and modem speed, and ultimately to the costs of these services and equipment. Technical difficulties can befall anyone in cyberspace, and usually do at one time or another, but they disproportionately affect those who have the least ability to pay.

The good news in the U.S. is that more people are attaining higher levels of education and filling millions of skilled, high-paying jobs in a strong economy. The bad news is that the least educated and skilled are getting a smaller piece of the pie and wealth disparities have reached unprecedented extremes. Narrowing this gap is surely one of the greatest challenges facing our country.

The virtual campus may widen opportunities for some, but not by and large for those at the low end of the socioeconomic scale, who have traditionally been underrepresented in higher education. Virtual space is infinite, but it does not promise universality or equity, nor is it appropriate for many students whose experience with technology is limited-and who might benefit far more from traditional delivery systems.

Computers and the Internet are nonetheless changing the world as we speak. Fast and reliable access to technology increasingly drives our economy and is key to individual opportunity in today's world. Special efforts must be made to equalize technology's availability and expand opportunity for all.

We offer no grand solutions. The issues are complex and the pace of technological change is overwhelming. But we do know that the marketplace by itself will not ensure access to technology. Government must play a part via incentive and safety-net programs to narrow the digital divide. The e-rate program under the Telecommunications Act of 1996, for example, has provided almost $2 billion in discounts for schools and libraries across the country.

But the e-rate program is only one strategy. Ultimately it will require the focus and determination of stakeholders in higher education, corporate America, and all levels of government to ensure that the technology revolution opens doors to all students, regardless of advantage.

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Transforming Education Through Information Technologies

Abstract

Category: Papers Presented at EDUCAUSE annual conferences

ID Number: EDU9907

Title: The Rensselaer 80/20 Model for Interactive Distance Learning

Author: Bradford C. Lister, Michael M. Danchak, Kim A. Scalzo, William C. Jennings, Jack M. Wilson

Organization: Rensselaer Polytechnic Institute

Year: 1999

Abstract: Undergraduate education at Rensselaer Polytechnic Institute has been transformed by the campus-wide use of interactive learning and studio teaching. Rensselaer's 80/20 Model for interactive distance learning is a natural extension of its on-campus educational environment and will form the foundation for the future development of professional and distance education at the Institute. This paper provides an introduction to the evolution of the 80/20 Model, a description of the techniques, technologies and design strategies involved in developing the synchronous and asynchronous components of an 80/20 course, and an overview of implementation issues.

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The Rensselaer 80/20 Model for Interactive Distance Learning

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Undergraduate education at Rensselaer Polytechnic Institute has been transformed by the campus-wide use of interactive learning and studio teaching. Rensselaer's 80/20 Model for interactive distance learning is a natural extension of its on-campus educational environment and will form the foundation for the future development of professional and distance education at the Institute. This paper provides an introduction to the evolution of the 80/20 Model, a description of the techniques, technologies and design strategies involved in developing the synchronous and asynchronous components of an 80/20 course, and an overview of implementation issues.

Introduction

Over the past decade Rensselaer Polytechnic Institute has transformed undergraduate education through campus-wide implementation of its innovative Studio teaching program. Studio courses are based on a foundation of interactive learning. Gradually Rensselaer has replaced large lecture halls with smaller studio classes where students are active creators of their own knowledge rather than passive receptacles of lecture delivered content (Wilson, 1994; Wilson, 1997; Jennings, 1998). Ongoing evaluation of both learning outcomes and costs have been very positive (Glinkowski, Hylan and Lister, 1997; Cummings et al., 1999) and the Institute continues to promote the growth and evolution of studio learning. This year alone Rensselaer has added 28 new studio classrooms designed for use with student-owned laptops and created new studio courses in computer science, math, engineering, economics, environmental sciences, and information technology.

While Rensselaer's on-campus learning environment has received national recognition and a number of awards, its distance learning program, RSVP, has also been highly successful, winning the General Motors Outstanding Partnership Award and the Best Distance Learning Program in Higher Education from the United States Distance Learning Association. Established in 1986, RSVP currently enrolls over 1000 students at 60 locations each semester in a diverse array of credit and non-credit courses. After several years of development, RSVP has recently adopted an interactive distance learning model that is a natural extension of Rensselaer's on-campus studio learning environment. This model, which we call the Rensselaer 80/20 Model, combines both asynchronous and synchronous learning and connects students, instructors and educational content in rich, online learning communities. In general, about 80% of a student's time would be spent on self-paced engagement of online materials and about 20% in interactive, synchronous learning sessions with the instructor and other students. These percentages are of course flexible and the optimal allocation of time to synchronous and asynchronous components, as discussed below, is a function of several variables including the nature of the course content, the age of the students, development costs, and faculty.

Evolution of the 80/20 Model

Lack of interaction has long been a drawback of traditional distance learning courses. Indeed, video-based instruction via broadcast television or video tape essentially emulates the large lecture hall mode of instruction and suffers from a similar set of ills. Starting in the late 1970s and early 1980s, a number of researchers began to add asynchronous computer communications and synchronous interaction via two-way cable television and audiographics to traditional distance learning technologies. These studies indicated that interaction greatly enhanced education at a distance with improved attitudes, earlier completion of coursework, better performance on tests, and greater retention all cited as positive benefits (Baath, 1982; Kwiatek, 1982; Lister, 1988). Unfortunately, these early technologies were often extremely expensive and technically challenging to implement.

During the early 1990s, Rensselaer's Anderson Center for Innovation in Undergraduate Education pioneered the development of new methodologies for interactive distance learning. The Anderson Center, founded in 1990, serves as an incubator for curriculum reform by supporting faculty involvement in educational computing, developing new techniques and facilities for interactive learning, and sponsoring cutting edge research on the assessment of learning outcomes. In 1993, working with AT&T Bell Labs, the Anderson Center created and delivered an experimental IDL course for AT&T's University of Sales Excellence which emulated a studio classroom by connecting students in three states with their instructor through computer screen sharing and ISDN video (Wilson and Mosher, 1994).

The AT&T course formed the foundation for interactive distance learning at RPI and led to the development of the Internet-based teaching and tutoring system called LeanLinc which is now a commercial product sold by the LearnLinc Corporation in Troy, New York. In collaboration with the Anderson Center, RSVP produced the first IDL course at RPI using the LearnLinc software in 1997, *Survival Skills for Research Scientists*, taught by an RPI instructor to students at the City University of Hong Kong. That same year the Anderson Center also created two innovative courses for the National Technological University that were the first full implementations of the 80/20 model, *Hands-On Multimedia* and *Hands-On World Wide Web*. *Hands-On World Wide Web* attracted some 8000 students at over 500 sites in North America and Asia, an NTU record (Lister, 1998). During the past two years RSVP has also invested in a research and development program aimed at enriching the asynchronous component of the 80/20 model (Danchak et al., 1998). Based on the success of these pilot projects, RSVP has begun development of credit courses in the 80/20 format that will be offered to its corporate customers starting in the spring semester.

Synchronous Learning with the 80/20 Model

While the majority of a student's time is spent in asynchronous activities, the synchronous portion of an 80/20 course is crucially important. The learning outcomes and student retention rates in purely asynchronous, Web or CD-ROM-based courses are often disappointing for all age groups, but particularly so for younger learners. From its inception, the RPI 80/20 Model attempted to create "the social construct" of an interactive, face-to-face classroom and capture all the benefits of a hands-on learning environment (Wilson and Mosher, 1994). One the main technologies we are using to implement the synchronous portion of our 80/20 courses is the LearnLinc 3.1 software system for interactive distance learning.

A LearnLinc session begins with the students logging on to the LearnLinc server via Internet Explorer or Netscape (Figure 1). Once logged on, students are connected to each other and to the instructor in a virtual studio classroom. Depending on student location and available technology, the course might utilize LearnLinc's digital voice and video capabilities for communication, or video and voice over ISDN lines. Using LearnLinc, the instructor can employ several tools to emulate the proven techniques of interactive teaching that are so effective in the face-to-face classroom. The instructor might begin by asking if there are any questions on homework, reading assignments or group projects. As an aid to answering student questions, the instructor can activate the LearnLinc white board and share stored graphics or solve analytic problems interactively by writing text and equations on the white board that appear on all of the student screens. The instructor can also bring up a Question and Answer tool that allows real time interactive quizzing and polling of the online students.

Following the format of a typical Studio class, the instructor might then present a brief mini-lecture on new content, sharing PowerPoint slides and multimedia, or using synchronized web-browsing to take the students to web-sites with course-related content. An extremely effective tool for interactive distance learning is the applications sharing feature of LearnLinc. Here the instructor can run any Windows-based software program on his or her machine and pass control over to any of the students. The students can then lead the class in running an interactive simulation or demonstration, or present a group project.

Asynchronous Learning with the 80/20 Model

By definition, the asynchronous portion of the Rensselaer 80/20 model is not coordinated in space or time. Students have always studied "on their own" but rarely have we attempted to put structure to this learning. We often tell them to "study chapter 10 and do problems 1 through 6", but little more. Should the asynchronous portion look more like the traditional classroom meeting or should it be more like the undirected independent studying students usually do?

As part of experimentation with the 80/20 model, we have tried, and are still trying, a number of approaches. One simple technique is to digitize the normal classroom activities and make them available on demand via streaming video. This updated version of videotaping may work well for some content and some students. Our goal of interactive distance learning answers this question with an emphatic yes! The other extreme, one that emulates independent study, may give the student a copy of slides used from an in-class presentation and tell them to go to it. Independence is valuable, but misses the input and feedback from instructor and other learners. Can we use this opportunity to do more?

It is not surprising that the most promising approach lies somewhere in the middle. What is very evident is that the structure and design of the asynchronous learning experience is crucial. We surveyed much of the learning literature and decided to combine techniques from instructional design, learning cycles, and distance learning (Gagne et al., 1992; Parker et al., 1996; Kolb, 1984). The result is shown in Figure 2. The components of Figure 2 are the "what", not the "how"! Content, student experience, and instructor preference may cause the "how" to vary, but the "what" should be constant.

The Interactive Distance Learning (IDL) Cycle starts with an introduction of the objectives and a statement of the necessary prerequisite material for this particular module. It strives to "humanize" the learning that is about to take place and make the student feel a part of a learning community. Following this motivational introduction, students are exposed to a concrete example (Concrete Experience) of what they are about to study (Step 2). Students are then asked to think about this experience (Reflective Observation) and share those thoughts with other students. Keep in mind, this is all done asynchronously. Step 4 (Abstract Conceptualization) presents principles or theories and requires feedback on performance. This is followed by an activity (Active Experimentation) that requires the student to go beyond regurgitating the content presented in Step 4. Finally, the student is prepared to transfer this new knowledge to future learning experiences.

This Cycle serves as a template for the asynchronous learning experience. Faculty can implement this cycle in any number of ways, depending on their individual circumstances. In working with various implementations, however, there seemed to still be something missing, particularly in the "humanizing" step. The learning modules lack personality. Among other things, we need to motivate students, orient them and give them direction. It has been shown that people seldom read a lot of text on the web. Hence, we needed something more than text to add this personality.

Figure 3 illustrates how we added personality to web courses. In selected instances, we used streaming video in a second window, called the "Guide Window", to give the illusion of the instructor talking directly to the learner. The effect adds warmth to the learner's experience, actually demonstrated through usability testing. Video streaming is used at major transition points. Elsewhere in the module, streaming audio is used to provide direction to the learner as well as support and encouragement. Additionally, text is occasionally used remind the learner of key elements without being intrusive.

The IDL Cycle represents the only real constant in our 80/20 Model. Implementation will vary greatly, provided the structure of the Cycle is accounted for. Two things we have definitely learned: there is no single way to implement the Cycle and asynchronous learning is not for everyone. Much depends on the learner's maturity and motivation. Students must know what to expect prior to enrolling in an asynchronous course. One aspect we have added is a "test-drive learning module". This gives prospective students an opportunity to "try before they buy" an asynchronous course.

Implementation Issues

In the implementation of the 80/20 Model RSVP has looked at two different issues relative to its existing program. First, does the support infrastructure that currently exists for traditional video-based courses work for 80/20? Second, how do we transition traditional video-based courses to the 80/20 Model?

Providing a robust support infrastructure is not new for RSVP and has consistently been a strong focus throughout its twelve-year existence. Using that as a basis, RSVP has tried to identify the support needs of the 80/20 Model. To date they include marketing and promotion, academic student services, comprehensive course websites, technical support for students, and enhanced course development support, including instructional design support and the use of a team approach to course development. Each support function and the infrastructure or services provided by RSVP is described below.

The web is quickly becoming the primary marketing/promotion tool for RSVP courses and degree/certificate programs. The RSVP website includes detailed program descriptions for each degree or certificate program and captures inquiries which are fed into a database for tracking and automatic response to potential students.

RSVP student services have historically been provided in the form of professional staff who act as the liaison or interface to the Rensselaer campus for the distance students and site coordinators. In the 80/20 model, most student services will be provided via the web. On-line student services include downloadable forms for admissions, transfer credit, and degree clearance, on-line registration, 24 hour on-line access to individual student, registration and billing information, and on-line access to update individual contact information.

Each RSVP course has a comprehensive website that includes the following components: syllabus, faculty & TA contact information, course calendar, course notes, on-line quizzes/exams, homework assignments, links to other course content, bulletin boards for asynchronous discussions, and videostreamed lectures where they exist. In the case of the 80/20 Model, where most of the course will be delivered asynchronously, the course web-site becomes the hub of activity for the course and is critical to its success. RSVP staff work with course faculty to set up the website and also provide media development support in the form of web material development, multimedia application development and digital audio/video production and editing.

Individual technical support for the 80/20 Model must be easily accessible and will be provided primarily via the web. For RSVP, potential students as well as currently enrolled students have on-line access to information about technical requirements for participation in RSVP courses as well as phone and email options for getting help with technical problems they encounter. It is also possible for a student to do a live certification of a technical connection over the phone.

A key component to the infrastructure needed for the 80/20 Model is a team approach to course development. This requires a paradigm shift from planning to support the delivery of a distance course to designing and developing a course for delivery via the web in a the 80/20 Model. At RSVP the "team" will include the content expert, an instructional designer, an instructional technologist, a media developer, an administrative contact, and an evaluation specialist. Depending on the course and faculty, it may make sense to have a project manager who is responsible for coordinating the different aspects of the course development cycle and ensuring effective communication between all the members of the team. This approach is modeled after the Design Component of Moore and Kearley's Components of a Distance Education System (Moore & Kearsley, 1996) and is being piloted by RSVP for a new course being delivered in the 80/20 Model in the Spring 2000 semester.

Given the IDL cycle, a critical piece of course development is instructional design expertise. For the shift to web-based delivery and to consciously promote interactivity similar to that achieved in Rensselaer's Studio Teaching Model (Wilson, 1994; Wilson, 1997; Jennings, 1998), it is important to ensure a sound instructional approach based in theory and proven concepts. We believe this is what will distinguish Rensselaer from other web-based distance learning providers. To realize this goal, however, we will need to provide IDL instructors with the support and guidance necessary to implement the cycle in online content.

RSVP courses have traditionally been delivered via satellite broadcast, interactive videoconferencing, and mailed videotapes. As stated above, satellite and videotape delivery are not generally very interactive. Videoconferencing, however, tends to be a more interactive delivery mode and is encouraged whenever possible. For the past several years, RSVP has encouraged more interactivity in RSVP courses, both synchronously and asynchronously, through the use of email, chat rooms, audioconferencing via the web, telephone conferencing, videoconferencing as a supplement to regular class lectures, and asynchronous bulletin boards for asynchronous discussions between students and with faculty. Most recently, RSVP has successfully piloted the delivery of courses solely on the web with comprehensive course web sites, which include videostreamed lectures, supplementary course content and options for synchronous and asynchronous interactivity. All of these steps are helping to transition traditional video-based courses to the 80/20 Model via web delivery.

Conclusions

In this brief overview of the 80/20 Model we have necessarily left out a wealth of detail. As a final point, however, we want to stress that the 80/20 proportions described in this paper lie on a sliding scale of possible allocations of time to asynchronous vs. synchronous learning. The optimal apportionment of time will depend to a large degree on both course material and the student population. In general, we strongly believe that real time, synchronous interaction is of central importance in most distance learning courses and that implementation of the IDL cycle in the development of asynchronous content is the foundation of effective online learning. Regardless of student age or the particular subject matter for a given course, interaction with instructors and computer-based content promotes improved learning outcomes at a distance just as it does in face-to-face classrooms. The synchronous sessions also help keep students on track with course deadlines, help build teams and community, allow students to receive immediate feedback, and improve retention rates.

In the future, increased bandwidth will undoubtedly permit increasingly realistic emulation of face-to-face classrooms. Advances in networks, tools and techniques will allow ever greater functionality in the design and delivery of IDL courses, improving both synchronous and asynchronous learning experiences. At this point in the continuing evolution of interactive distance learning, implementation of the 80/20 Model through thoughtful use of existing tools such as LearnLinc, careful application of the IDL cycle, and attention to support and implementation issues, can greatly enrich web-based courses and significantly enhance online learning for off-campus students.

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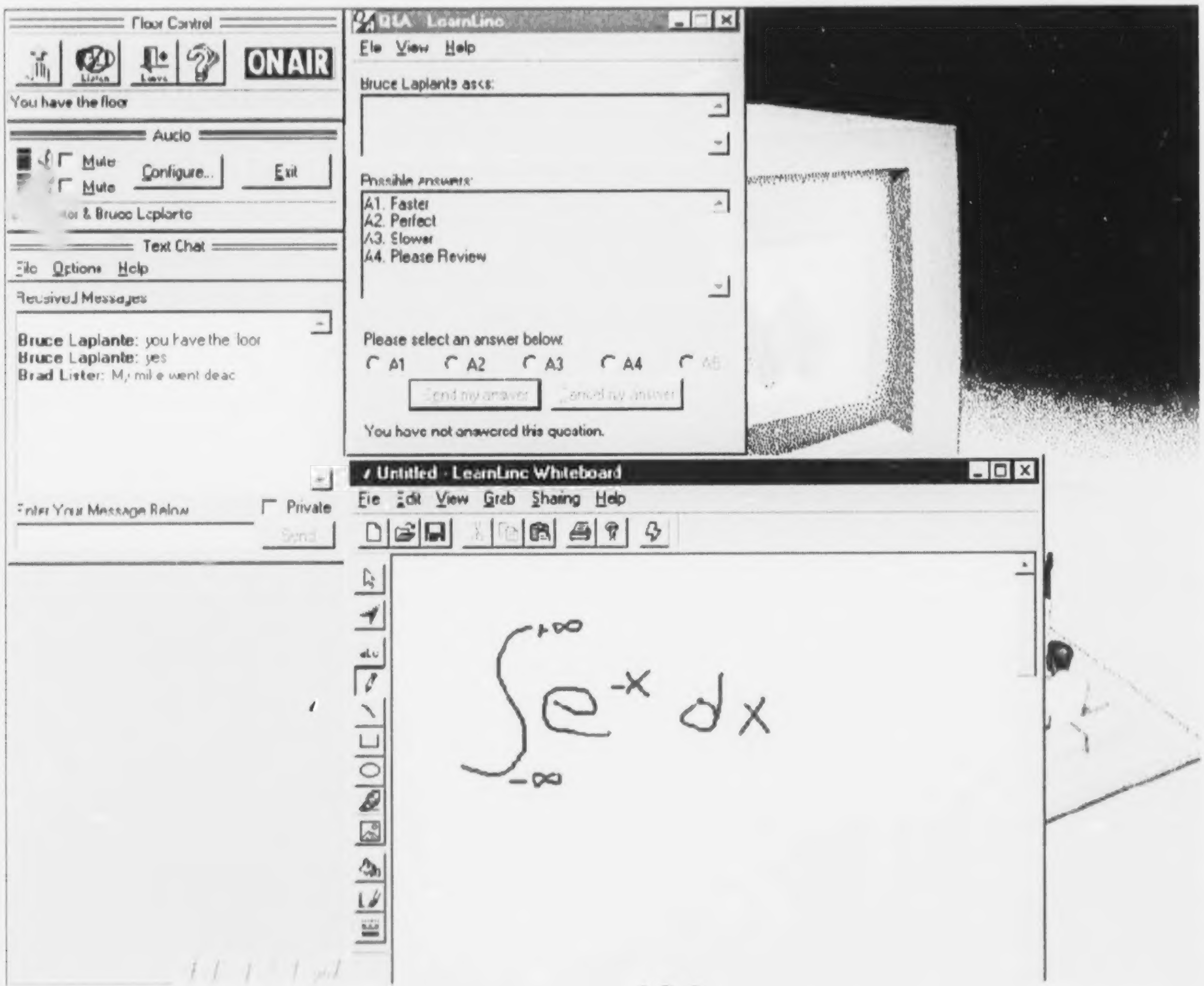
Floor Control
Listen
Leave
ONAIR
Audio
Configure...
Exit
Text Chat
File Options Help
Q&A LearnLinc
File View Help
Untitled - LearnLinc Whiteboard
File Edit View Grab Sharing Help

You have the floor

☐ Mute

☐ Mute

& Bruce Laplante

Received Messages

Bruce Laplante: you have the floor
Bruce Laplante: yes
Brad Lister: My mike went dead

Enter Your Message Below ☐ Private Send

Bruce Laplante asks:

Possible answers:

A1. Faster
A2. Perfect
A3. Slower
A4. Please Review

Please select an answer below

○ A1 ○ A2 ○ A3 ○ A4 ○ A5

Send my answer Cancel my answer

You have not answered this question.

$$\int_{-\infty}^{+\infty} e^{-x}\,dx$$

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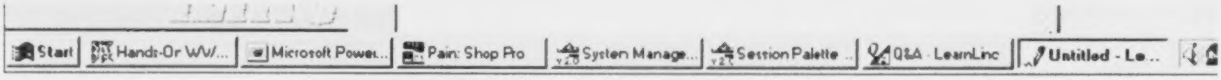
Start
Hands-On WW/...
Microsoft Powe...
Pain: Shop Pro
System Manage...
Session Palette ..
Q&A - LearnLinc
Untitled - Le...

Figure 1. The LearnLinc student interface. Students can send private or public text messages to the instructor as seen on the left hand side of the screen. The instructor can also bring up the white board and share text and graphics with the students. At the top right is the Q&A tool for real time student polling and quizzing . Other LearnLinc tools include synchronized web browsing, applications sharing and the ability to capture and present student computer screens.

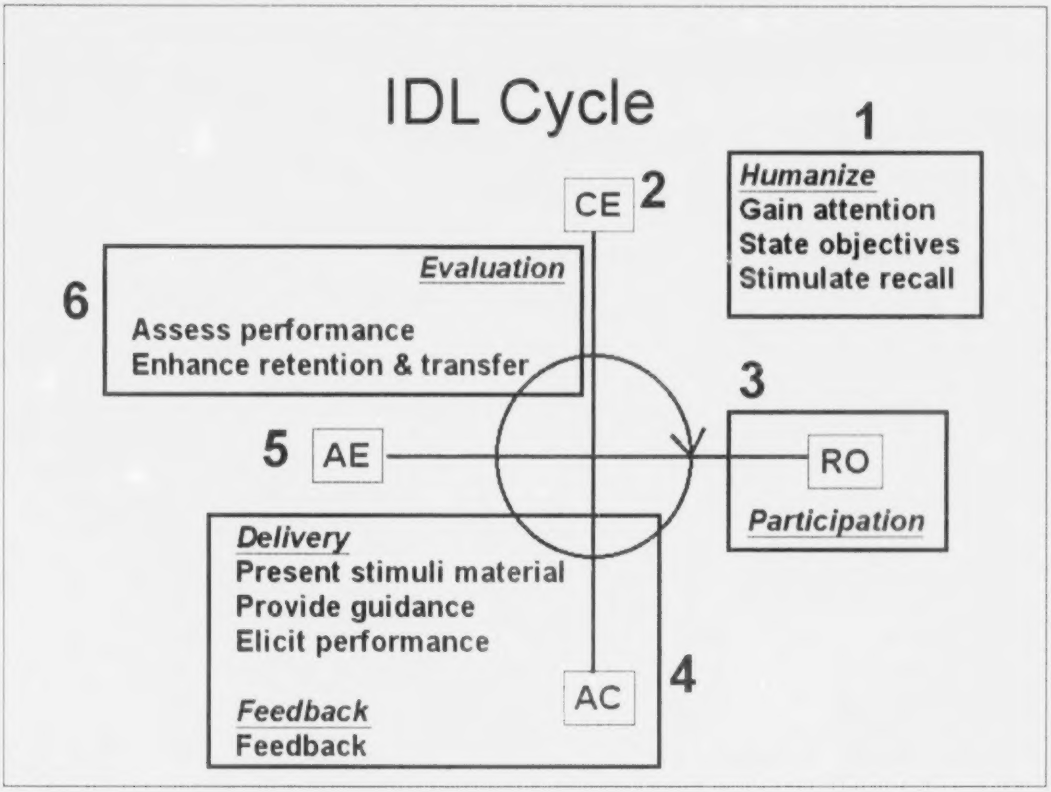
IDL Cycle
1
Humanize
Gain attention
State objectives
Stimulate recall
CE
2
6
Evaluation
Assess performance
Enhance retention & transfer
3
5
AE
RO
Participation
Delivery
Present stimuli material
Provide guidance
Elicit performance
Feedback
Feedback
AC
4

Figure 2. Interactive Distance Learning Cycle that combines a variety of concepts. This cycle combines concepts from instructional design, distance learning and learning styles. The steps represent "What" must be done. It is up to the instructor to choose "How".

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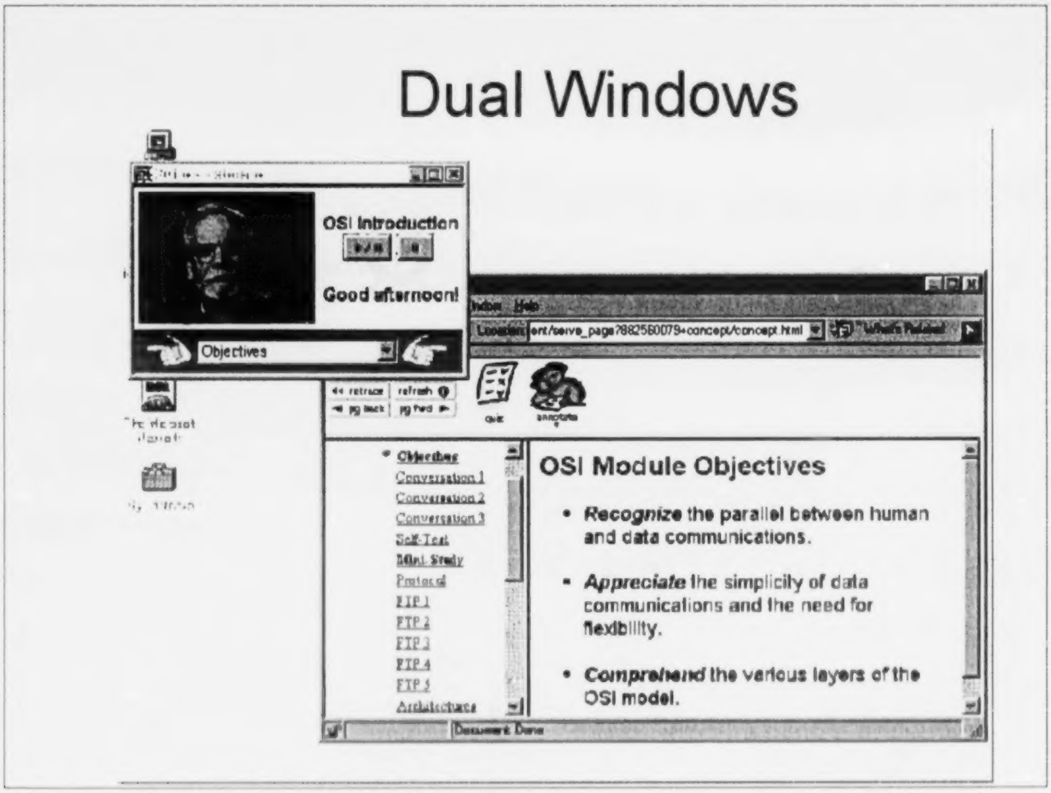

Dual Windows

OSI Introduction
Good afternoon!
Objectives
retrace
refresh
pg back
pg fwd
quiz
annotate
Location: ent/serve_page?8825B0079+concept/concept.html
What's Related
Objectives
Conversation 1
Conversation 2
Conversation 3
Self-Test
Mini Study
Protocol
FTP 1
FTP 2
FTP 3
FTP 4
FTP 5
Architecture
Document: Done

OSI Module Objectives

- ***Recognize*** **the parallel between human and data communications.**
- ***Appreciate*** **the simplicity of data communications and the need for flexibility.**
- ***Comprehend*** **the various layers of the OSI model.**

Figure 3. Addition of a personality in a new window that complements the contents. This "Guide" Window uses video streaming, audio streaming and text to emulate an instructor's function. However, it does not lecture.

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Abstract

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Title: The Roles Database at the Massachusetts Institute of Technology

Author: Jim Repa

Organization: Massachusetts Institute of Technology

Year: 1999

Abstract: MIT has implemented a system, called the Roles Database, to centrally manage people's authorizations for computer-based applications enterprise-wide. Roles or authorizations are centrally defined in understandable business terms, and then converted to the native representation of each application to which they apply. An authorization is a 3-part entity consisting of a Person, a business Function, and a Qualifier. The hierarchy-based Qualifier defines the scope of the authorization, narrowly, as an individual account number, or broadly, as a department, school, or the entire organization. This system supports an environment where many people are authorized to perform similar tasks, but for different departments or fiscal areas. This paper summarizes the design of the Roles Database and describes how it is being used to manage authorizations for MIT's data warehouse, SAP financial system and other applications.

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The Roles Database at the Massachusetts Institute of Technology

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EDUCAUSE Conference
Long Beach, California
October 29, 1999

Additional information available at http://web.mit.edu/rolesdb

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MIT has implemented a system, called the Roles Database, to centrally manage people's authorizations for computer-based applications enterprise-wide. Roles or authorizations are centrally defined in understandable business terms, and then converted to the native representation of each application to which they apply. An authorization is a 3-part entity consisting of a Person, a business Function, and a Qualifier. The hierarchy-based Qualifier defines the scope of the authorization, narrowly, as an individual account number, or broadly, as a department, school, or the entire organization. This system supports an environment where many people are authorized to perform similar tasks, but for different departments or fiscal areas.

The presentation will summarize the design of the Roles Database and describe how it is being used to manage authorizations for MIT's data warehouse, SAP financial system and other applications.

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7. Data feeds into and out of the Roles Database
8. Where are we today?
9. Plans for the future

Why a Roles Database?

In a large educational and research institute such as MIT, the job of maintaining people's permissions to perform specific tasks on multiple computer systems can be complex and time-consuming. There are rules that permit people to spend or approve purchases on certain account numbers, report on financial or personnel information, decide on a prospective student's admission to a specific school, etc.. The responsibility to decide who should be allowed, for example, to spend on an account number is held by the department or individual within the department who "owns" the account. But the knowledge required to set up the permission in the financial system to allow a person to spend on an account number is held by a system administrator for the financial system. Even if there were an interface for "general users" to enter authorization information in individual systems, it would be different for each system, and general users would not want to learn all of these interfaces.

The departmental administrators with knowledge about their departmental resources and who needs access to them do not have an easy way of looking up or changing these authorizations in the various systems that give access to their departmental resources. Because it is hard to report on authorizations for all of these systems, the authorizations are often not cleaned up when a person leaves the department or changes responsibilities. And there is the potential for mistakes when a departmental officer makes an authorization change request in business terminology and an IT person must translate that into the arcane technobabble of each system.

We wanted to find a better way to maintain people's authorizations for various computer-based systems in order to make this maintenance easier, less time-consuming, and less error-prone.

Main Principles behind the Roles Database

We reasoned that we could improve the process of maintaining enterprise wide authorizations if we had an authorization system based on these four principles:

1. Maintain information on people's roles or authorizations for computer-based systems in a central database, then disseminate the data to the various systems where these authorizations are enforced.
2. Define authorizations or roles in understandable business terminology, then have the system automatically convert them to the arcane format required by each application.
3. Take advantage of the fact that people in different departments perform similar business tasks, but with different sets of financial or departmental resources. Define authorizations as three-part entities:

   Person *can do* **Function** *for* **Qualifier**

   (who) (what) (where)

   Here, the qualifier represents a department, an account number, or any other object that limits or qualifies the scope of the person's ability to perform the business function. Qualifiers are maintained in hierarchies, so an authorization can be defined to apply to a "leaf" of a tree (e.g., an account number) or a whole "branch" (all account numbers in the School of Science).
4. Have the departmental administrators who know their department's resources and personnel be the ones to maintain authorizations, not a central person who cannot be familiar with all the people and resources in every department.

The notion of a centralized authorization system is not entirely new, but we could not find any existing systems that would meet our specifications. At MIT, there is a list-maintenance system called Moira that is used for access control of some resources within project Athena at MIT. And, the University of Michigan has developed an authorization system based on LDAP. However, neither of these follow the three-part model we prefer (Person + Function + Qualifier) or easily support the hierarchies that are a natural part of Qualifiers. So, we designed and developed our own system, which we call the Roles Database.

What is an Authorization?

In the Roles Database, the main object that defines a person's authority to perform a business task is an **authorization**. As mentioned above, an **authorization** is a 3-part entity, consisting of a **person + function + qualifier**.

When creating an authorization, each of the three components must be selected from a previously-defined list of possibilities, reducing the likelihood of mistakes. Person, function, and qualifier are the most important fields in an authorization; there are some other minor fields that will also be discussed below.

The term **authorization** implies that a person is permitted to do something on a given system. In many cases, that is exactly what it represents: the permission for a person to perform a business function in a computer-based system. However, an "authorization" can also represent a role, a responsibility or position in a workflow-based system. A person can have many authorizations applying to the same or different systems. It is also possible that a single authorization for a person could affect more than one system; for example, an authorization to do financial reporting for an account number might apply to both the SAP financial system and the data warehouse.

Let's look at each of the three main components of an authorization.

The **person** is represented by a username, or more specifically, a Kerberos principal within the mit.edu domain.

A **function** is one of the tasks that a user can be authorized to perform on a given system. Functions are grouped by application (known as a "function category" in Roles jargon). Each function has associated with it a specific qualifier type; for example the "Financial reporting" function is associated with a qualifier type of "Account number". When an authorization is created, the qualifier chosen must be of the right type to match the function. Some functions apply to more than one system, such as the financial reporting function that gives a person authority to report on a given account number in both the SAP financial system and the data warehouse.

A **qualifier** can be an account number, organization number, budget group, etc.. Since qualifiers of each type are organized into a hierarchy, a qualifier can also be a branch of the tree of account numbers, a branch of the tree of organizations, etc. Qualifiers are generally extracted from other systems as part of a nightly feed. Some functions are either "all or nothing" and do not require a qualifier; in these cases a placeholder qualifier of NULL is included in the authorization.

Here are some examples of authorizations:

Person	**Function**	**Qualifier**
FredFlyn	Create Requisitions	F2283900 (Bioengineering PhD Program)
JaneDoe	Approve Requisitions	SG_BIOLOGY (Spending group for dept. of Biology)
SueSmith	Financial Report	PC152000 (Spending group for dept. of Chemistry)
JonClerk	Assign employee ID numbers	NULL (no qualifier needed)

There are additional fields that can be set at the time an authorization is created: effective_date, expiration_date, grant, and do_function. Effective_date specifies the date on which the authorization will first go into effect, and expiration_date specifies the date on which the authorization will cease to be effective. The grant and do_function fields are related to the ability to create authorizations and will be explained in a subsequent section.

Two additional fields are automatically stored for each authorization: the date last modified and the person who made the modification. In addition, a complete audit trail of all authorization changes is kept in another table.

The Qualifier Component of an Authorization

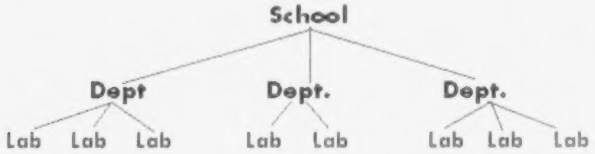
We think it is worthwhile to reiterate the reasons why an authorization has a separate function and qualifier. Often, people are authorized to do a function only within an organizational unit or a financial area. People perform similar functions in different departments, but are limited to their own resources or areas. By having a qualifier, the number of functions can be kept small, and the logic that will be needed to process them in the systems supported by the Roles DB can be kept relatively simple. As mentioned above, if a function does not require a qualifier, the function can be defined so that the associated qualifier type is NULL.

One might ask, if qualifiers are good, why not have more than one qualifier per authorization? We've found that one qualifier is a good compromise between simplicity and understandability vs. versatility. In defining the sort of roles that people have in a business sense, one qualifier is generally enough.

A case in point would be financial reporting. There could be lots of options for generating reports about activity on an account. One could imagine using two qualifiers for such authorizations, the first for the account number and the second for a list of possible activities that a person could report on. But we haven't found the need to have many different options here; so far only two options have been specified (with and without salary subtotals), and these have been handled by defining two different functions.

By trying to think in terms of a few simple roles or business functions with a single qualifier, we've so far been able to keep the authorizations relatively simple to explain and maintain. In the translation program that converts the Roles-style authorizations into the native format of the target application, in some cases the simple authorization must be translated into a list of complicated options. But this is hidden from the end user, and we've kept the Roles function definitions simple and understandable for the people using the Roles Database.

As we mentioned earlier, qualifiers of each type are organized into a hierarchy. For example, organizational units are hierarchical:



When an authorization is created to allow someone to do, for example, personnel reporting, the qualifier selected could be for a lab, a department, or a whole school. This simplifies the process of maintaining authorizations. If the qualifier chosen for an authorization is a branch of a tree and the "leaves" change, the person's authorization automatically extends to the new leaves under the tree.

Account numbers are also hierarchically grouped. Their structure is a "web" rather than a strict hierarchy, ie., an account number can be a member of more than one group.

Who can create, update, or delete authorizations?

The ability to create an authorization is restricted by **function** and **qualifier**. An administrative officer in a department will be allowed to grant authorizations for people to perform certain business functions for that department's resources. For example, an administrative officer (or in our terminology, a **Primary Authorizor**) within the department of Biology would be able to grant requisitioning authority for any account number within the department of Biology, but not for account numbers in the department of Chemistry. Note that the Primary Authorizor in Biology can grant such an authorization to *any* person at MIT who has a Kerberos username, not just to people who officially work within the department of Biology.

When granting an authorization, the officer in Biology can decide whether or not the newly-authorized person can further delegate that authorization to others. In this way, a pyramid of responsibility can be defined. A central administrator of the Roles Database needs to know who the Primary Authorizors are for each department, and sets up these people with the authority to create authorizations for resources within their departments. Each of the Primary Authorizors can decide to delegate the authority to grant certain authorizations for the resources of their department or a subset of these resources. Every authorization change is recorded in an audit trail that can be viewed by department heads, auditors, or others to verify that authorizations are being granted according to departmental or institute guidelines.

In the Roles Database, there are two mechanisms for permitting users to create authorizations. Central Roles Database administrators have a "meta-authorization", an authorization about authorizations, that allows them to create any authorization related to a given system or "function category". For example, the following authorization would allow JoeRoles to create any authorization within the SAP category.

Person	Function	Qualifier
JoeRoles	Create Authorizations	Category SAP (SAP financial system)

Notice that the authority to create an authorization implies the authority to delete or modify the same sort of authorization. In this case, JoeRoles would also be able to delete or modify any authorization within the category SAP.

The second and more common mechanism for permitting users to create, delete, or update authorizations involves the **grant** flag in an individual authorization. Each authorization has a "grant" flag that determines whether the person named in that authorization can grant it to others.

If the grant flag is set to Y, the owner of the authorization can grant a new authorization, or delete or change an existing authorization where:

- Person is anybody at MIT (with a Kerberos username)
- Function is the same function as that in the original authorization
- Qualifier is the either the same qualifier or one of its descendents in the hierarchy
- Grant-flag is either Y or N

There is also a do_function flag in each authorization that states whether or not the authorization will be effect in the target application. If the do_function flag is set to N and the grant flag is set to Y, then the person can grant the authorization but not perform the business function themself.

The creation of authorizations with the grant flag equal to Y is the mechanism that would be used to allow a school or department administrative officer, for example an official in the School of Engineering, to set up authorizations for others granting them access to departmental resources. For example, suppose Smith has the following authorization:

`Original authorization:`

Person	Function	Qualifier	Grant-flag
Smith	Spend Funds	Fund Ctr 100012 (School of Engineering)	Y

This would allow Smith to grant an authorization to "Spend Funds" for all of Fund Ctr 100012, or a subset of it, *i.e.*, any fund or fund center within the School of Engineering. Smith would, for example, be able to grant the following authorizations:

`Examples of authorizations Smith could grant:`

Person	Function	Qualifier	Grant-flag
Jones	Spend Funds	Fund Ctr 100012 (School of Engineering)	Y
Brown	Spend Funds	Fund Ctr 100056 (Chemical Engineering)	N

But Smith would not be permitted to grant the following authorization, because Anthropology is not a subset of the School of Engineering:

`Smith can't grant this:`

Person	Function	Qualifier	Grant-flag
Rice	Spend Funds	Fund Ctr 100084 (Anthropology)	N

The Software - How Is It Implemented?

The Roles Database system consists of the following software components

1. An Oracle database running on a DEC Alpha platform.
   The database stores authorizations, people, functions, and qualifiers in their respective tables. It has additional tables to keep track of the hierarchical relations between qualifiers, and other miscellaneous information.

2. A PowerBuilder application, running on client Macintoshes and Windows machines.
   The PowerBuilder application is used to
   - Maintain the list of functions, the 2nd component of authorizations
   - Maintain authorizations
   - View authorizations, people, functions, and qualifiers according to a versatile set of reporting options

3. A set of stored procedures and functions written in PL/SQL.
   The stored procedures are used in conjunction with the PowerBuilder application. Security-related processes, such as the checking of meta-authorizations, are implemented in the stored procedures, not in the PowerBuilder front-end.

4. A set of Perl scripts (using the DBI module for access to Oracle) running on the DEC Alpha.
   There are scripts that populate the Person and Qualifier tables each night using data from the Data Warehouse. There are also some scripts involved with transforming Roles-style authorizations into formats usable by SAP. However, for most systems, the transformations of authorization formats are handled by the target system. (See the section on data feeds.)

5. An Apache web server using Perl CGI scripts running on a separate Sun SPARC station.
   The web server was built after the PowerBuilder application, and it provides an easy interface for viewing authorization and other data in the Roles Database. Users access the web interface using Netscape browsers. For web pages that are not "public", authentication is done using x.509 certificates issued from MIT's own certificate authority. Any user at MIT with a Kerberos principal can get an MIT-issued certificate that contains the person's Kerberos principal.

   The web interface can be used to
   - View users' authorizations in various ways.
   - View the various qualifier hierarchies, such as Profit Centers and Cost Objects, Organization

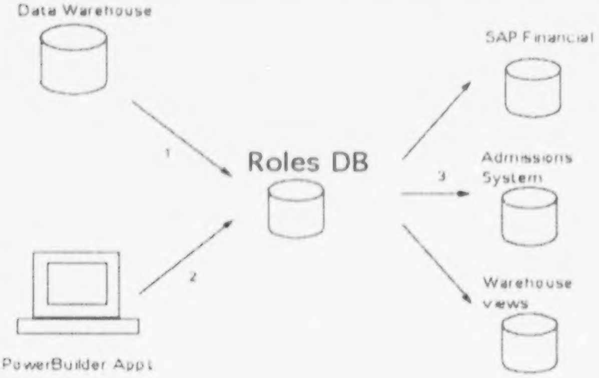
Units, etc., with or without their related authorizations. The hierarchical displays of these data have turned out to be useful to people at MIT who are not interested in authorizations.

- Maintain some types of qualifiers, for the types of qualifiers that are not automatically extracted from data in the Warehouse.

In the future, we plan to enhance to web interface to allow people to maintain authorizations as well, so that the PowerBuilder application will not be needed for anyone except "power-users".

Data feeds into and out of the Roles Database

The following diagram shows the main areas where data flows into and out of the Roles Database.



The main paths where data flow into or out of the Roles Database are the following:

1. Supporting information is fed nightly from data warehouse to Roles DB.
   These data include a list of people at MIT with their Kerberos usernames, and various types of qualifiers, such as financial objects and organization units. The data are used to populate the Person and Qualifier tables.
2. The PowerBuilder front-end application is used to create authorizations in the Roles Database, and also to maintain the list of pickable functions.
3. Authorization information is converted, and transported to various applications.

There are two main ways that authorization data are extracted from the Roles Database for use in target systems:

A. Target application "pulls" authorization data from the Roles Database.
   This is the preferred scenario.

   Authorization data are "pulled" from the Roles Database using an SQL select statement against a view on the Authorization table.

   In this way, a target system can extract a list of authorizations that pertain to it. Where an authorization pertains to a branch of a qualifier tree, the view automatically "expands" it to show each individual leaf of the tree. Then the target system is responsible for enforcing the authorizations - once authorizations are extracted, the Roles Database is out of the picture.

B. Roles Database "pushes" authorization data to target system

   Authorization data are periodically processed by a Perl script on the Roles machine to convert them to an external format and then sent to the target application.

This model was used for authorizations for the SAP financial system. We found that we could write the conversion programs more quickly in Perl on the Roles machine than the SAP developers could write them in ABAP/4. There still is an ABAP/4 component, however, which takes flat files of SAP-authorization and SAP-profile changes and applies them to the SAP system. Again, once the authorization information has been pushed to SAP, the Roles Database is out of the picture and has nothing else to do with enforcing the authorizations.

On each of the target systems, users either log on and are authenticated using the Kerberos usernames, or for web-based systems, they are authenticated based on the username contained in their x.509 certificate. Each system checks authority to perform each transaction by comparing the username and desired function and qualifier against its locally stored table of authorizations.

Where are we today?

The Roles Database is used or soon will be used to maintain authorizations for several systems at MIT. So far, only part of the task of the maintaining authorizations has been distributed to the various departments, but the task of defining guidelines and writing documentation is proceeding, as is a phased roll-out of the Roles application to one department at a time. Also at this time, new systems at MIT are adopting the Roles Database for maintaining their authorizations, so the use of the Roles Database is expanding in this dimension also.

Many users across the campus use the web interface for viewing trees of financial objects and related authorizations, and the easy access to the data have made it easier for departments to identify mistakes in their department's authorizations. Even in the cases where the department is not yet using the Roles application to directly input their authorization changes into the system, the simplified reports of authorizations available via the web interface has made it easier for them to send requests for changes to central system administrators. The next phase of our roll-out will allow more departments to make these changes themselves, and we will see more time savings.

The following systems are using or soon will be using the Roles Database for maintaining authorizations at MIT:

- SAP financial system

  The Roles Database has been used for maintaining authorization information for SAP since June, 1998. Most of the activity in the Roles Database pertains to SAP authorizations. The availability of web-based reports on departmental authorizations has been essential for some steps of the roll-out of SAP to various departments at MIT. As more components of SAP are adopted at MIT, we will support their authorizations with the Roles Database. Distribution of authorization maintenance is expected to reap the greatest time savings for SAP-related authorizations.

- Graduate Admissions system

  The locally-developed Graduate Admissions system has also used the Roles Database for maintaining their system authorizations since early 1998. Because the system is based on an Oracle database, it was particularly easy to integrate it with Roles-based authorizations. Maintenance of authorizations is currently done centrally in the admissions office, but there are plans to distribute this maintenance to the departments at some undetermined date in the future.

- Data warehouse

  MIT's locally-developed data warehouse currently shares SAP financial reporting authorizations to control viewing of financial data. The Roles DB will soon control authorizations for viewing of personnel data. In the warehouse, converted authorizations are used as a joined table for VIEWs of financial data. This implementation was also relatively easy.

- Budget system

  MIT has a locally-developed budget system, called NIMBUS, that has used the Roles Database for its authorizations since it went into production earlier this year. Authorizations are currently centrally maintained by the budget office; distribution of maintenance will be discussed at a later date.

- Checking of paper Invoices and Travel Documents

  The Roles Database is used to store people's authority to sign paper documents. This summer, it replaced the authorization-checking component of a locally-developed Electronic Requisition System which was phased out after SAP was put into production. People in the Procurement, Travel, Physical Plant, and other offices use the web interface to check the authority of signers of paper documents. (The Roles application does not store digitized signatures or help to combat forged signatures.)

- Central IT infrastructure systems

  The Roles Database is used to maintain the authorizations for assigning MIT ID numbers and for performing system-related tasks in the Roles Database itself.

Plans for the future

We've already mentioned the ongoing work (a) to support the authorizations for more systems at MIT and (b) to continue distributing the job of maintaining authorizations to local departments. In addition, we're planning the following technical enhancements.

1. Hierarchicalize functions

   Currently, the third component of an authorization, the qualifier, is part of a hierarchy. An authorization for a node in a tree applies to all the leaves as well.

   It makes sense to do something similar for function component. A good example comes from some common financial tasks. There currently are four separate functions for "requisition approver," "invoice approver," "travel documents approver," and "financial reporting," but in many cases the same person does all four things. So it would make sense to have a parent function, "general financial approver," that would have the other four functions as children in a tree of functions. Then a person authorized as "general financial approver" for the department of biology would automatically have the equivalent of four authorizations, as "requisition approver," "invoice approver," "travel documents approver," and "financial reporting," all for the department of biology.

   When this enhancement is put into place, extracts of authorizations from the Roles Database will not only expand the qualifiers to show all the leaf-level qualifiers for each authorization, but expand the functions as well.

2. Create a consolidated tree that includes different types of qualifiers

   As a result of the history of stovepipe systems at MIT, there are several versions of a department hierarchy. Personnel organization units, financial profit centers, and financial fund centers all are organized into similar but different hierarchies that represent someone's view of MIT's organization structure.

We want to be able to define departmental Primary Authorizors, people who are responsible for setting up authorizations for departmental resources. But there is no single integrated department hierarchy that is linked to qualifiers of various types. To set up a Primary Authorizor for the department of Biology, one needs to define meta-authorizations for SG_BIOLOGY (the top node of Biology's spending groups), FC100108 (the top node of Biology's fund centers), 0HPC0000501 (the top node of Biology's profit centers), and 151000 (Biology's organizational unit).

Once there is general agreement on a single departmental hierarchy at MIT, with a commitment to maintain links to the various objects associated with each department, it will be possible to create a single Primary Authorizor meta-authorization that covers the creation of any authorization related to a department's resources. In addition, it will be easy to display on a single report all authorizations related to a department's resources.

The work involved in developing and maintaining a single overarching department hierarchy at MIT will involve as much political effort as it will technical effort.

3. Enhance the web interface

We plan to enhance the web interface so that people with the proper "meta-authorizations" will be able to create authorizations using their Netscape browser. At a later date, we will decide whether to keep maintaining our existing PowerBuilder application or to roll all of its functionality into a more comprehensive web interface.

Last modified by repa@mit.edu on October 1, 1999.

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Abstract

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Author:	Alice G. Howard
Organization:	University of Virginia
Year:	1999
Abstract:	The Instructional Toolkit is a Web-based application that allows instructors at the University of Virginia to easily create and manage class home pages -- or to selectively use electronic features such as class e-mail lists, class rolls, anonymous course feedback, student homework submission, and final grade submission. First used by 28 brave instructors in Spring 1996, the Toolkit has been continually enhanced with new features and modifications to existing functions -- increases in use and acceptance have been dramatic -- over 1200 classes were using the Toolkit in September 1999.

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The University of Virginia Instructional Toolkit -- Class Home Pages without Angst or HTML

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The Instructional Toolkit is a Web-based application (http://toolkit.virginia.edu) that allows instructors at the University of Virginia to easily create and manage class home pages -- or to selectively use electronic features such as class e-mail lists, class rolls, anonymous course feedback, student homework submission, and final grade submission.

First used by 28 brave instructors in Spring 1996, the Toolkit has been continually enhanced with new features and modifications to existing functions -- increases in use and acceptance have been dramatic – over 1200 classes were using the Toolkit in September 1999.

Introduction

In essence, the Instructional Toolkit (http://toolkit.virginia.edu) provides two basic components to University of Virginia instructors: class home page creation tools, and electronic course management tools such as class rolls, final grade submission, and on-line ordering of textbooks. Its role in the instructional environment is as a complement or supplement to a classroom-based course – it does not provide a mechanism for delivery of a completely on-line course.

A colleague of mine, Lara Ashmore, wrote a paper (http://www.people.virginia.edu/~lha5w/toolkit_paper.html) in 1996 about the original release of the Instructional Toolkit (Toolkit) to the faculty at the University of Virginia (UVa). In that paper she devoted several paragraphs to explaining why a university might want to develop such a tool, and why an instructor might want to use it. In the fall of 1999, it seems unnecessary to have to explain the desirability of having such a tool. A number of higher education institutions have developed similar tools, some have gone on to license and distribute them, and there are also commercially developed products on the market.

Many instructors now embrace a class web page creation tool that allows them to post and distribute their syllabi, announcements, homework assignments, and some of their course content (e.g. electronic reading materials, lecture slides, graphic illustrations) in a manner that is paperless and relatively free of operating system differences and dependencies. Rather than prepare a paper-based course content packet well ahead of the semester, they can add to and adjust their materials as the semester progresses. Students are generally very enthusiastic about the convenience of accessing course-related materials from their dorm room or apartment, 24 hours a day, 7 days a week.

UVa's Toolkit allows instructors to easily create and maintain class home pages (without needing to know HTML), and to use other on-line functions that are unique to the UVa environment. For example:

- the Toolkit retrieves data from the Registrar's Course Offering Directory (COD) in the process of creating a class home page
- class rolls can be downloaded from the Registrar's Student Information System (ISIS) after automatically checking that the Toolkit instructor is the same as the "instructor of record" in ISIS
- final grades can be submitted electronically, again after rigorously checking that the submitting instructor matches the corresponding instructor data in ISIS
- instructors can take materials to the University Library to be scanned into electronic format (PDF) and then uploaded into the Materials section of their Toolkit class home page

The Toolkit has been developed by staff in UVa's Department of Information, Technology and Communication (ITC). Ongoing development of the Toolkit has been guided by the desires of UVa instructors and students who have been polled and interviewed about suggestions for improvements and new features, and for help in prioritizing development efforts. Within ITC, the Toolkit team (2.5 FTEs, from 5 persons) is a unique, ongoing collaboration (with members drawn from several ITC divisions – including one team member who has been telecommuting from Australia for the past 15 months) that develops, maintains, and provides most of the user support for the Toolkit.

Functionality

From the student point of view, the Toolkit offers the most centralized listing of class home pages at UVa, and provides class home pages with a consistent interface and navigation conventions. Their instructors have often provided course materials such as a syllabus and supplemental readings, and are using communication tools like class e-mail lists and on-line announcements. See examples at:

http://toolkit.virginia.edu/1999_Fall_ECON416-1

http://toolkit.virginia.edu/1999_Fall_ENTC840-1

From the instructor point of view, the Toolkit offers a mechanism for easily creating, modifying, and maintaining class web pages. It also offers options to get information (class rolls, final grades) into or out of UVa's Student Information System, to create a class e-mail list, to review electronically submitted homework, to receive anonymous feedback from students, and to copy the contents of the class web pages from one semester to the next.

For most elements of a Toolkit class home page, instructors can choose from 3 basic methods of providing content:

- they can type their information into a web form
- they can upload a file of any mime type (e.g. MS Word, MS PowerPoint, HTML, plain text, image files, etc.)
- they can supply a URL and redirect that element to any other location on the Web

Class e-mail lists are automatically created when the instructor downloads the class roll – and instructors can opt to have a log of the semester's class e-mails as part of their class home page – some use this very much like a traditional newsgroup (without having to master newsgroup concepts).

The "administrative features" of the Toolkit do not have a corresponding entry on the class home page, but rather provide the instructor with links into other institutional resources and with other options for managing their class home page.

a. The Security feature allows instructors to give permission to other individuals (usually graduate student TAs) to add to or modify the content of their class home page, and to give permission for Library staff to upload scanned documents into their Materials section. Instructors can also choose to password-protect their whole Toolkit class home page, or to password-protect selected parts of it (e.g. Materials for copyright purposes, the E-mail log for privacy purposes, etc.)
b. Final grades can be submitted by uploading a file containing student IDs and their grades, or by filling in an on-line form that mimics the "bubble-in" sheet that the Registrar provides for entering final grades.
c. There is a function that copies most of the content from one Toolkit class home page to another – this allows instructors to easily transfer their efforts from one semester to the next. And there is a command to delete the class home page altogether.

Functions that interact with other services at UVa include the textbook order form (that goes to the University Bookstore), a link to the Library's request form to have materials scanned and uploaded, and a function that links the class home page into the Registrar's online Course Offerings.

A recent Toolkit usage report shows that the most popular single feature is the class e-mail list (77%), followed by a syllabus (46%), then electronic materials (35%), anonymous feedback (25%), announcements (16%), related links (16%), redirection to a custom URL (16%), assignments (13%), class password protection (10%), and using "administrative features" only (9%). Historical data indicates that 10-15% of classes will use the final grade submission feature at the end of the semester.

Development and Acceptance

The initial development of the Toolkit was undertaken in 1995 when web editors and HTML converters were uncommon and many faculty were just beginning to explore the possibilities and capabilities of the Web. Hence the original goal to make the Toolkit easy to use without needing to know HTML. Ease of use, consistency, and predictability remain major guiding principles for the ongoing development of the Toolkit. At the same time other forces (primarily UVa faculty as they become bolder and more sophisticated users of the Web) push for greater flexibility, the addition of new features, and enhancements to existing features. Continuing to place a high priority on ease-of-use while also trying to accommodate users' desires for greater functionality and flexibility has become a difficult balancing act. Some instructors would like the ability to further customize their own Toolkit class home page – with options to change the graphic appearance and to choose their own names for links. The Toolkit does not currently provide for that level of customization. All significant changes to the Toolkit system are made during the summer or between the fall and spring semesters so that the system will remain stable during the semester. Everyone with a Toolkit Instructor account is automatically on an email list that is used to provide information about future plans and imminent changes.

The Toolkit code underwent a complete rewrite in the summer of 1996, propelled by the staff's need to make it more secure (thus allowing interactions with the Registrar's data) and more modular for ease of maintenance and development. Several times since then we have done significant under-the-hood work to keep the Toolkit code (written in perl and running on a Sun Solaris server) current with other evolving technologies and applications. The intent has been to keep these changes invisible to Toolkit users.

Many visible changes have been made because UVa instructors have made specific suggestions to the Toolkit staff – or have found an existing feature difficult to use. Several times during the past 3 years, everyone who has a Toolkit Instructor account has been polled to see which features they would like to have added or enhanced, and to ask what their priorities are among these choices. The development of the Toolkit has been guided by these user preferences and priorities. In addition to polling and interviewing Toolkit instructors, other UVa faculty, who are renowned for the sophistication of their own class home pages, have been interviewed and asked for suggestions – the idea to add an Anonymous Feedback feature came from such a faculty model.

During the summer of 1997, three major enhancements were made to the Toolkit: the ability to download class rolls and have them automatically form the basis for a class e-mail list, the ability to upload final grades, and improvements to the Materials function. Up to that time, creating a class e-mail list (using the existing majordomo system) had been considered a major hassle by many faculty – hence the Toolkit e-mail list was designed to alleviate faculty frustration. One Chemistry professor had long lobbied for the ability to submit grades electronically – especially for very large classes where instructors were already keeping an electronic gradebook – and he became the first to help test this function in 1996-97. "Submit Final Grades" was incorporated into the Toolkit production system in Fall 1997. The Materials function was also rewritten to make it easier to use and to enable uploading of more than one file at a time (via a zip file) – the one-file-at-a-time model had been a bottleneck for some instructors.

During the past two years, some pages, lists and features have been reworked (and reworked again) to make them more logical, compact and easier to use -- and the navigation bars have been enhanced and made more consistent throughout the Toolkit. The ability to redirect all or parts of a Toolkit class home page to another URL and to incorporate (link back to) selected Toolkit features (e.g. homework submission, anonymous feedback) has increased flexibility for Toolkit users – especially for the more sophisticated and ambitious ones. On the other hand, the ability to "hide" a Toolkit class home page, allows instructors to use parts of the Toolkit (e.g. class rolls and e-mail lists, submitting final grades) without having a public class home page at all. The Toolkit provides extensive on-line Help (in the form of FAQs and how-to documents) and these have been revised and augmented as the system has evolved.

Two more significant changes were introduced in January 1999. The ability to give Library staff permission to upload scanned documents into the Materials section required a minor adjustment to the Toolkit code, but has had a large ripple effect in terms of the number of instructors using the Toolkit and in the amount of disk space they are consuming! The ability to allow students to submit their homework assignments meant a large and complex change to the Toolkit code, requiring for the first time that students get a Student Toolkit account and login before uploading their homework files – and requiring students to become familiar with how to upload files (generally they have a lot more experience in downloading them).

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Growth in the number of classes using the Toolkit has been dramatic over the past four years. (28 in Spring 96, 42 in Fall 96, 61 in Spring 97, 189 in Fall 97, 349 in Spring 98, 594 in Fall 98, 822 in Spring 99, 1299 so far in Fall 99). From talking with instructors and getting feedback from other support staff at UVa, we know that this growth is attributable to multiple factors: ease-of-use is definitely a factor; so is the enthusiasm of many instructors who proselytize among their colleagues; increasing flexibility has won over some who were skeptical in the early stages of the Toolkit; the ability to influence the development of the Toolkit is important; the consistently caring attitude of the Toolkit staff and excellent assistance given by them wins friends and converts; student expectations that their instructors will provide a class web page is a factor for some faculty and TAs; and the Toolkit's interactions with other UVa resources (primarily with the Registrar and the Library) are critical to its success.

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The biggest increases in use of the Toolkit correspond to the introduction of two of its most popular features. The ability to have a class e-mail list automatically generated (by clicking on the link to download the class roll for the first time in a semester) was introduced right before the Fall semester of 1997. At that time, the "postmasters" within ITC who administer our majordomo lists began recommending that instructors investigate having a Toolkit class e-mail instead – and the numbers of Toolkit users increased dramatically. In the Fall of 1999, the Library discontinued their "electronic reserves" system in favor of the scan-and-upload-to-the-Toolkit service that they had pilot tested in the Spring 1999 semester – again leading to a dramatic increase in the number of Toolkit users.

Two other major enhancements to the Toolkit, electronic homework submission and electronic submission of final grades have been slower to achieve general popularity – at least in part because they appear complicated to instructors and students. The "Submit Final Grades" feature has been used for four semesters and is gaining momentum. Instructors who have used this feature have been surveyed afterwards – and their suggestions for improvements and fixes have mostly been implemented. This feature also requires an extraordinary degree of support from Toolkit staff who moniter the Toolkit email in the evenings, over weekends, and during the Christmas holiday in order to provide assistance with this time-critical process. The homework submission feature (introduced in the Spring 99 semester) is still being experimented with and assessed.

Partnerships

The emphasis on partnerships has been essential to the success of the Toolkit. Getting guidance, feedback, and suggestions from UVa faculty has been extremely valuable. Toolkit staff have good ideas and experience with instructional technology, but none of us are UVa faculty. So it is essential that we get input and "reality checks" from those who really use the Toolkit in their courses. In the process, instructors feel positive (and perhaps a sense of ownership) about being able to influence the Toolkit's evolution.

Several very popular features of the Toolkit (class rolls, class e-mail, and final grade submission) would not have been possible without the cooperation of the University's Registrar and her staff. For the Registrar, the most important considerations for the Grade Submit function were (and are) security and accuracy of grades. Her office has the highest sense of pride in their completely blemish-free record (derived from the random auditing of transcripts) -- and she wanted to keep this impeccable record. Hence the University auditors were included in the planning and review of this function. The process was tested (and debugged) with selected faculty for several semesters before being opened to any Toolkit instructor -- it still requires the instructor to sign and submit a paper form -- and the electronic results are checked visually before being accepted

During the Summer and Fall of 1998 the University Library re-evaluated their electronic course reserves service. Some ITC staff were invited to participate, and we decided to try a pilot project (during Spring 1999) that would result in instructors incorporating their "electronic course reserves materials" into their class home pages -- instead of having those materials maintained by Library staff on a Library server. At the end of that pilot test (which ended up having 275 participants instead of the 15-25 originally expected), the Library felt the service to be so successful that they moved their entire electronic reserve system to the Toolkit this Fall. Clearly the Library is providing the staff-intensive part of this service in which they scan materials for instructors and then upload them into the Materials section of a Toolkit class home page as PDF files. (During Fall 98 they processed 1,166 requests and scanned 15,985 pages -- to date in Fall 99, they have processed 3,254 requests and scanned 33,430pages.) The Toolkit code only had to be slightly modified to accommodate this new service -- although it has had a serious impact on our disk needs and on the amount of effort needed to support many new Toolkit users. During the pilot test period, we started collaborating with the Library in providing Toolkit training -- using both their electronic classroom and their faculty and graduate student e-mail lists to publicize the classes. These have proven to be a very effective means of reaching instructors -- many of our introductory classes have been over-subscribed and we've offered more than we ever had in the past. This collaboration has been very rewarding for both ITC and the Library -- and UVa instructors have a new, very popular service with the side-benefit that we often work together in solving their problems.

Current Challenges

Sometimes it's been a real scramble to anticipate and keep up with the growth and popularity of the Toolkit -- particularly in terms of hardware, disk space management, and support. In 1996-1997 the Toolkit code shared a server with some experimental applications -- after a runaway process brought the Toolkit to a halt, we concluded that it was not a felicitous combination. In the Spring of 1998 the Toolkit system (both the production system and the test system) moved to its own new server (a Sun Solaris system). In the near future we plan to move the Toolkit test system to a separate server too. Disk space started to be consumed at an alarming rate during Spring 1999 -- largely due to the Library's scan-and-upload service -- we added a 9 gigabyte drive over Spring break, and added two 18 gigabyte drives this September. We're now looking at establishing an upper limit for Toolkit disk space, on a per class, per semester basis -- probably something like 100 megabytes. A recent report showed that fewer than 20 classes (out of the more than 3000 classes that have ever used the Toolkit) actually use more than 100 megabytes. So far we have never archived "old" Toolkit class home pages to some other media or server -- but we're looking at our options in this area also.

The demand for support has definite peaks and valleys throughout the semester -- August/September and January are intensely busy, with smaller (but very time-critical) needs at the end of each semester during the final grade submit period. Much of the support for the Toolkit is delivered via e-mail -- queries are sent to

itc-toolkit@virginia.edu -- all five Toolkit staff receive the email sent to this address, with one of us designated to answer it. Fortunately the requests for user support have not grown at the same rate as the use of the Toolkit -- although twice as many classes were using the Toolkit in September 1999 as were using it in September 1998, the requests for Toolkit support only increased by 35%.

The surge in putting electronic materials in PDF format in Toolkit class home pages has resulted in some frustrations in ITC and Library public lab facilities where students are trying to print massive amounts of PDF files

-- printer queues back up -- printer output gets misplaced, etc. Currently a group of ITC and Library staff are looking at the various factors that contribute to this printing bottleneck, and are hoping to find ways to alleviate this situation.

Keeping up with other evolving applications is another challenge. Currently certain sections of the Toolkit are not able to display documents created by Microsoft Office2000-to-HTML or to accommodate the new format of PowerPoint2000-to-HTML documents. We're working on these two problems, but they are neither the first nor the last of this kind.

And we are currently working on several new Toolkit functions:

- a gradebook that started life as a stand-alone program on ITC's Unix servers and has been rewritten to operate as a Toolkit function -- but it needs further testing and refining before becoming part of the production system;
- a quiz-generator program (purchased from the Maui Education Technology Research and Development Center) that we are trying to incorporate as a Toolkit function.

When the proposal for this EDUCAUSE presentation was submitted last March, I rather naively imagined that the Toolkit would have a new graphic appearance by this October. We spent May and June working on a prototype for a "new look" (http://www.itc.virginia.edu/~krm5a/toolkit/designOne) that generally received rave reviews from those (mostly other ITC staff) we showed it to. In July we solicited feedback about the prototype from Toolkit instructors, using a web-based survey devised by our graphic designer. Results were mixed -- many were quite positive about the compactness and simplicity of the new layout -- but the color palette and new logo were not received positively enough for us to feel comfortable about adopting them. It also became apparent that UVa instructors are quite attached to the Rotunda image, the quintessential logo for the University of Virginia. So we've gone "back to the drawing board" -- and back to incorporating the Rotunda into a new "new look" (http://www.itc.virginia.edu/~krm5a/toolkit/designTwo) and now are planning to make this change in January 2000.

Lessons Learned

- Get to know your audience well and put a very high priority on their needs and preferences
- Go the "extra mile" to provide consistently timely, tactful, knowledgeable help for users
- Provide services which integrate course-related resources and data across the institution
- Make the product easy to use and reliable
- Nurture a product team that has a high degree of commitment and enthusiasm for the product, and a high degree of trust and confidence in each other
- Introduce changes "gently" to instructors -- some of the very early users of the Toolkit were quite dismayed when the Toolkit changed from Release 1 in the Spring of 1996 to Release 2 in the Fall of 1996 -- thereafter we have not changed the Release designation -- but we have introduced a number of changes as "enhancements" to the current system.

The theme of Educause '99 is "Celebrating New Beginnings". The introduction of the Toolkit into UVa's instructional environment in 1996 definitely marked a "New Beginning for UVa Instructors". In 1999, with the surprisingly significant level of usage (about one-third of all Fall semester classes), and the enthusiastic acceptance of the Toolkit, we certainly have something to celebrate!

Notes

Technical Requirements for Users:
Netscape version 2.0 and greater for Unix, Windows (95, 98, NT) or Mac or
Microsoft Internet Explorer 4.0 and greater for Windows (95, NT, 98) or Mac

Distribution of Code:

The Toolkit software is freely available to other universities for their own use -- with the caveat that the code is quite UVa-specific and will require a significant amount of work to fit into another environment.

EDUCAUSE *Information Resources Library*

Transforming Education Through Information Technologies

Abstract

Category: Papers Presented at EDUCAUSE annual conferences

ID Number:	EDU9951
Title:	Transformation of Education And ICT, An Example from the Netherlands
Author:	Hans Outhuis
Organization:	Hogeschool IJselland, University of Professional Education
Year:	1999
Abstract:	This paper gives an example from the Netherlands of how we are working on a transformation of education and how information and communication technology is facilitating this. The author works in the department of Teaching and Student Affairs of Hogeschool IJselland, University of Professional Education in Deventer in the Netherlands. Within this department he is involved in the role of information- and communication technology and library services in the educational process.

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TRANSFORMATION OF EDUCATION AND ICT; AN EXAMPLE FROM THE NETHERLANDS

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Abstract

This paper will give you an example from the Netherlands of how we are working on a transformation of education and how information and communication technology is facilitating this. The author works in the department of Teaching and Student Affairs of Hogeschool IJselland, University of Professional Education in Deventer in the Netherlands. Within this department he is involved in the role of information- and communication technology and library services in the educational process.

Introduction

This paper will give you an example from the Netherlands of how we are working on a transformation of education and how information and communication technology is facilitating this. At first a brief introduction in the way higher education is organised in the Netherlands is given and some details about the IJselland University of Professional Education. After that a transformation of education that is taking place, is described. In what way we are working on this transformation is the subject of chapter 3 of the presentation and the role ICT is playing in chapter 4. The paper finishes off with some thoughts on the work that still needs to be done.

Higher Education in the Netherlands

A short introduction to the Dutch system of higher education in general and IJselland University in particular will be helpful to understand the perspective from which this paper is written.

In Figure 1 the American and the Dutch educational systems are compared. The blue boxes are comparable. After high school a Dutch pupil goes either to vocational school, or to a type of higher education that is called in Dutch "hogeschool" but is named "university of professional education" abroad to prevent a confusion between hogeschool and high school. The third type, pupils with the right previous education in high school can choose, is the university. At the far right the enrolment in the separate types of education are given for the Dutch situation.

Figure 1

		1998 (x1000)
University	Universiteit (WO) (University)	155
Colleges Community Colleges	Hogeschool (HBO) (University of Professional Education)	285
High school/vocational	Vocational (ROC)	420
	MAVO-HAVO-VWO Voortgezet onderwijs	856
		1534

To clarify the distinction between universities and universities of professional education some differences are given. Some of them are arguable. The most important difference (and not disputed) is that the core business of universities of professional education is....education. Some applied research is done but that is of minor importance. In Dutch universities research is of major importance and according to some the core business of the university. Universities of professional education are relatively young. Most of them started 13 years ago. As a consequence the silo structure is not as strong as it is in universities. That is an advantage in standardisation of IT and for the co-operation between for example the IT department and the library. Universities have more financial resources. They get more grants from the federal government and are better in pulling in money from businesses. Universities have more experience with ICT. It took some time before ICT investments were a management-issue in universities of professional education. In the Carnegie Classification definitions, Dutch universities would be Research universities or Doctoral universities. Most Dutch Universities of professional education would belong in

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the category Master's universities and colleges.

Some figures about higher education in the Netherlands. To educate students the universities of professional education received in 1998 a total of 1.3 billion dollars in federal grants. Universities received 2.2 billion. The tuition fee for both types of universities is 1400 dollars. This fee is the same for all students in public universities. There are a few private universities of professional education that ask much higher fees, but there enrolment is rather small. The first private university has yet to start in the Netherlands. All Dutch students can get a grant form the federal government of about 200 dollars per month. Dependent on the income of the parents they can get a scholarship from the federal government of about 200 dollars per month on top of that. To meet the estimated standard of living for a student (they should be able to spent 600 dollars a month), student can get cheap loans form commercial banks that are subsidised by the federal government. But most students don't want to make debts during their study and combine their study with a job.

IJselland University is situated in the Netherlands, in the province of Overijssel as is hogeschool Enschede, University of Professional Education. IJselland had at its start in 1986 about 2500 student. In 1996 we moved in to a new building that was meant for 4000 students. Now in 1999 we teach 6500 students. That's one of the reasons why a rebuilding will take place next year.

To make the education of 6500 students possible, somewhat more than 500 staff is employed of which 200 are teaching staff. 25% of the student is part-time which is a relatively high percentage for a Dutch university of professional education. In 1998 there were 100 foreign student from 20 countries. Approximately 120 Dutch students went abroad that year. Fifteen 4-year degree courses that are of the baccalaureate level are offered. And thirteen 1-year Master programs.

In January 1999 IJselland University was awarded best university of professional education by a Dutch magazine that compared the results of quality audits that are made by external committees for all the 4-year degree-courses in the universities of professional education. Those audits are made in a 4-year cycle.

IJselland University ended at the ninth place (of 52 universities of professional education) in a national election by students for best university earlier this month.

The Need for a Transformation of Education

Education is changing, not by substitution but a transformation is taking place. This transformation is brought about by changes in the student population and by changes in the demands by employers. This goes for the universities but in vocational schools and high schools comparable changes are taking place. Education is becoming more and more **student centred** and **competence based**. Education has to be more student centred and less teacher centred. The student will be treated more and more as a costumer. And that has some important consequences: The first is that education has to become more flexible. Education will be partly independent of time and place. A student can take a course anytime he wants and any place. That could be in school, but it could also be at home or at the working place (training on the job!). Students differ in the way they learn. Student centred education will take into account the learning style of the student, his or her personal characteristics and passed experience. Digital learning environments can make that possible. The shift from a teacher-centred to a student-centred education does not mean that education will become independent of teachers!. The interaction with teachers remains very important, and modern ICT-tools facilitate this interaction. Flexibility has to be organised. Organizing interaction and communication is essential when education is delivered asynchronously.

The second consequence of being student centred is that the combination of studying and working has to be facilitated. During their career as a student, our students will evolve from a working student, what they are now (more than 80% of our students have a job) to a studying worker what they will be during there professional career (life-long learning). So facilitating the combination of work and study means that students have to be able to make arrangements with employers about the shifts they are available for work. It means that Universities have to create jobs for students themselves. Common practice in the United States and at Dutch universities but not at Dutch universities of professional education. And that is beneficial to students, but also to the university. Student-assistants are skilful with ICT-tools. Why not let them assist faculty in building Web-based courses. They both can do what they are good at and working with students is an excellent opportunity to deliver student-centred courses. Finally facilitating the combination of work and study means a supply of courses that are fit for life-long learning. ICT tools make it possible to deliver training on the job.

Education will be competence-based. We are not filling the student with knowledge, insights and skills but making him competent to work as a professional in a rapidly changing environment. We are teaching him to learn, because learning will not stop after the initial university-study. Life-long learning is important. This does not mean that knowledge, insight and skills will become less important. It means that the teacher will be more called upon as a coach of learning processes and less as a specialist in the discipline he has studied himself. The students will find the information they need in different ways. ICT helps with that.

To become a competent professional it is important to be in touch with your chosen field of profession from day one of your study. Universities can make that possible by offering courses in which real life cases are the basic principle. They also can simulate real life. In fact a laboratory is such a simulation, or a call centre students can practise in, or a virtual firm of consulting engineers. The best way to get in touch of your field of profession is of course to go there. That good be as an intern during your study, a job besides your study or you can use the ICT-tools, for example for a videoconference.

ICT is a toolbox for the changes in education. Learning and teaching can be made more effective and efficient by making use of courseware, e-mail, digital learning environments and databases from which we retrieve information. And of course the internet. On the world wide web an enormous amount of information is available. The transformation of education is inevitable. But how are we getting there?

How Are We Getting There?

At my university we try to get there by using an integrated approach, looking for alliances and stimulating the participation of faculty.

The Integrated Approach

Some major projects are going on in our university. We started a program on flexible learning, made some changes to the organisation of the university, are rethinking the Administrational processes, we are re-arranging the building, thinking about a virtual library. All these projects have in common that they are a consequence of a student centred approach. And they are (therefore of course) related.

Flexible learning (learning independent of time and place, taking into account the characteristics of a student) implicates that students do have access to computers. We are bringing more computers into our building and give students access to network from their home or their work. A GroupWare-product is introduced and the use of the Intranet is intensified to organise interaction and communication. A standard digital learning environment (Lotus Learningspace) will be introduced in all the institutes of the University.

These institutes are the result of some *changes in the organisation* of the University. The institutes are the education units. The staff in the institutes is nearly only teaching staff. All other positions (Financial economical affairs, Personnel affairs, Facility management, Student-administration, Student services, Library, IT department) are placed in two departments. Those departments have to deliver customer-oriented services. So not only the education has to be student-centred, the university as a whole has to be costumer-oriented. The facilities the departments offer have to lower the thresholds for the use if ICT in education. That is why a teaching technology centre will be equipped.

Rethinking the Administrational Processes. Most of the administrational processes for the students of the 8 institutes take place in one of the two departments I just mentioned. The departments act as one service-centre. This service-centre has to act as a one-stop-shop for the students. I saw a fine example of such a one-stop-shop in a presentation by the University of Minnesota at he Educom-conference last year. We are trying to build one as well. The basic idea is that a digital environment is build for the student. An environment in which not only the digital learning environment is placed but also all the other information the student (and the organisation) needs during his career in university. This digital environment is build around an individual study-contract that is made up between the student and the university.

We are *rearranging the building*. The reason is obvious. As I mentioned before the building was meant for 4000-5000 students and now there are more than 6500. But we are also taking in to account changes in education. And so the student is the starting point. Student-activities are concentrated in the central parts of the building. We are making a study landscape with about 300 computers. And the way the institutes are placed in the building should be recognisable for students.

And finally *the library*. SAB is a abbreviation for the Dutch name of the library involved. A translation would be "City archive and Athenaeum library". For your and my convenience I'll use the abbreviation SAB, as we do at my university. Although the IJselland University is only 13 years young, the SAB has been a library for higher education for more than 400 years. It started as the library for the Athenaeum Illustre and later the "latin school" where Erasmus studied.

Nowadays the SAB has three costumer groups:

- The city of Deventer; the SAB administers the archives of the city of Deventer and is the library for the civil servants of the city.
- The province of Overijssel; the SAB serves the inhabitants of the province of Overijsel whose academic needs for library services cannot be fulfilled by the public libraries.
- The IJselland university; the SAB is the library for the 6000 students and the 500 staff of the university. IJselland University is responsible for the management of the SAB and its 30 employees.

The SAB is a relatively heavy user of ICT. In that regard it is an knowledge centre to the public libraries in the province of Overijssel and to he cultural institutions and the educational institutions in the city of Deventer. Together with the public library of Deventer the SAB has started the Virtual Library Deventer. Objective of the Virtual Library Deventer is to offer library services 7 days a week, 24 hours a day. Most services can be accessed from home or work.

Universities used to be built around libraries. The library as the centre of knowledge. But nowadays knowledge is literally everywhere. By using ICT it is no longer important from what place the physical services are coming. From where the books and the magazines are delivered or the services of the information specialist are given. But not only can information be consulted digitally consulted, the information itself is digitalised more and more. And you don't have to own the information. There is a shift of emphasis from collectioning to giving access. The virtual library comes in sight. In Deventer we are building such a virtual library. Together with the public library of the city. In this virtual library the catalogues of available books and magazines can be accessed on the internet. You can make book reservations. Maybe in the near future you can get the books you want to borrow delivered at your home address. You can subscribe to e-mail alerts on new books or the contents of magazines you select. You can easily access a variety of information about local history. On numerous subjects links are given of which the quality is checked by the information specialists and that can be used to start a surfing tour. Interactivity is important. You can ask questions to the information specialists by e-mail and get a response within 24 hours. You can contribute to discussion lists on several subjects. But this does not mean that the library as a place you can go to has to close its doors. Also in the near future there will be a need for a physical place where you can read, study, access information and where you can get help to do so. In the IJselland University there will be created a "study-landscape" in which about 300 computers will be available to students. The study-landscape will also be a physical integration of the IT-department of the university and some of the library services.

A librarian is, and will be in the future, a broker between the demand en the supply of information. The demand of information is rapidly changing and the supply of information is growing very fast. Digital sources will be more and more important. That will have consequences for the librarian as well.

-Our children grow up in a visual culture. We grew up in a reading culture. Librarians should become visual literate to be able to assist these new costumer groups.

-The librarian has to learn to work with new ICT tools. At first the tools will be used for substitution: the existing services will be made more efficient and effective. Information will be found faster, that is if the information has been made accessible.

But in time the ICT-tools will be used for a transformation of service delivery.

-The library-services will be more and more driven by demand, not by supply. The librarian has to anticipate wishes of costumers or customer-groups. He sometimes has to act as an account manager.

In a 4 year degree course in Small Business at our sister university in Enschede, a group of 150 students is supervised during their entire study by a team of 5 staff-members of which one is a librarian. Just like her 4 colleagues she is a coach of learning processes. The transformation of education is not possible without changes in the way the university organises its processes. The projects I just told you about are an attempt to do just that.

Looking for alliances

But it is not enough. We have to look for alliances. Alliances are essential because there are no blueprints for the way we should use the ICT-toolbox for the transformation of education. Libraries, cultural institutions and educational institutions are all going through the same process: they get more and more customer-oriented and ICT is for them an important tool-box to reach their goals. So co-operation seems obvious. That means giving and taking. We all have experiences with standardisation of ICT tools in our own organisation. Negotiations at this point between organisations are even more laborious.

Co-operation can be about content and about infrastructure. About content because costumers are often not really interested in the physical place the information they need is coming from, that is if they can be sure it is correct. In some cases we will have to build a common (virtual) front office and two or more institutions will work together in the back office. IJselland works through SAB, our library, together with cultural institutions of the city at the digitalisation of the cultural heritage of the city of Deventer. Co-operation can also be about infrastructure. In the city of Deventer IJselland University works together with a vocational school (6000 students), 3 high schools (6000 pupils) and 50 elementary schools in creating a shared ICT infrastructure that is managed by the university.

Other institutions of higher education are changing also and we can benefit from their experiences (and they from ours). That why we in the Netherlands are working together on ICT and education in an organisation called SURF. SURF can be regarded to some extent as the Dutch equivalent of Educause. Surf organised the trip for most of the Dutch delegates at this conference. A delegation that is the largest outside North America. A proof for the importance we attach to international alliances.

Participation of faculty

We are only getting there when staff and students want to get there. Teaching and other staff play an important role in educational changes. These changes will bring about (or are brought about) new tasks and a new way of working (but not everything will be new though). Most teaching staff won't be able pick up this new way of working by themselves. A personnel policy of the institutions is necessary. A policy that takes account for employability, because we have to be competent as well. We also have to learn to learn. Sometimes an opportunity is given to practise what we preach. When we did the migration from Windows 3.11 with Perfect Office, or even for quite a number of staff DOS with an older version of the office suite, to Windows NT with Office 97 we had to train staff in using the new software. We choose not to give a classical training in which all the features of the Office-suit are demonstrated and practised in 20 or so afternoon-sessions but offered a two-day course according to the learn to learn principle. The basics of the Office suite, the web-browser and the e-mail client were practised and they were made familiar with the course material that would make it possible to organize their own training on the job, according to their needs. It went rather well although it was difficult to adjust to very different levels of computer skills.

Another possibility to practise what we preach is the virtual store for the department of Personnel affairs. In that store ICT is used to optimize a costumer-oriented approach. A staff member will be able to get personalized information and services, independent of time and place 24 hours a day, 7 days a week. The university will make arrangements with a supermarket. When you have to work late, you can send in your shopping-list by e-mail, and the goods will be delivered at your home-address.

The Role of Information and Communication Technology

We come to the role of Information- and Communication Technology. I hope I made clear ICT is a tool-box for the transformation of education. No more, no less. Thanks to ICT I can access information that is stored anywhere. There is a shift from collectioning information to giving access. The role of a teacher is changing. He will be no longer the only (or the most important) source of information. Information will be tailor made. ICT facilitates communication. Communication between students and staff and staff and students among themselves will be intensified through ICT. That is of crucial importance for the effectiveness of education especially in a flexible learning environment. ICT makes interaction a lot easier. It stimulates an active participation of students and staff in the educational process. As an integration of this al these developments web-based education has a very strong future.

Epilogue

Let me finish of with two issues that are very important in the near future. We have to share our knowledge. Within institutions and between institutions, nationally and internationally. This conference is a very nice example how this can be done.

And we have to practice what we preach. To transform is not easy. Not even for us, the advocates of these changes, together in California. Can we learn from each other in a "transformed" way, facilitated by Information and Communication Technology? It is a challenge to organize our ways of sharing knowledge in a way that they are fine examples of transformation of education with ict.

EDUCAUSE *Information Resources Library*

Transforming Education Through Information Technologies

Abstract

Category: Papers Presented at EDUCAUSE annual conferences

ID Number: EDU9919

Title: Transforming Higher Education: Building a Statewide Partnership

Author: Ann Hill Duin, Linda L. Baer

Organization: University of Minnesota, Minnesota State Colleges and Universities

Year: 1999

Abstract: Over the past two years, the authors have led a statewide initiative to create a virtual university. In this paper, they share two taxonomies for classifying virtual universities. The authors present their initial list of readiness criteria or those criteria that preferably need to be in place, and definitely should be addressed, before beginning a statewide virtual university effort. The authors also describe their key partners and how they have built a statewide partnership. This paper begins a discussion on identifying criteria for determining if a state (or region) is ready for a virtual university initiative.

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Transforming Higher Education: Building a Statewide Partnership

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Abstract:

Over the past two years, we have led a statewide initiative to create a virtual university. In this paper, we share two taxonomies for classifying virtual universities; we present our initial list of readiness criteria or those criteria that preferably need to be in place, and definitely should be addressed, before beginning a statewide virtual university effort; and we describe our key partners and how we have built a statewide partnership.. Our primary purpose is to begin a discussion on identifying criteria for determining if a state (or region) is ready for a virtual university initiative.

Long Beach
EDUCAUSE '99
OCTOBER 26-29

Understanding the Context Surrounding Minnesota Virtual University

"A virtual university must be a real university offering learning opportunities otherwise denied. It must be, above all, a network for life long learning which meets the new learning needs of a new century" (Teare, Davies, & Sandelands, 1998, p. 8)

Over the past two years, we have been involved in a statewide initiative to create a virtual university. Article 34 of Minnesota's 1997 Higher Education Bill defines our state's virtual university as a system to provide the uniform delivery of higher education administrative services and program offerings to students through the electronic medium of the Internet.

With one million dollars in state funding, our two public higher education systems -- the Minnesota State Colleges and Universities and the University of Minnesota -- have collaborated with private colleges, state departments, industry representatives, and community organizations to develop two online resources: an advising and career planning tool known as ISEEK (Internet System for Education and Employment Knowledge, www.iseek.org), and a common course catalog known as MnVU (Minnesota Virtual University, www.mnvu.org). These two resources provide learners, counselors, and employers with a "virtual" advising office for help with needs assessment, program identification, and financial aid; and a common catalog for links to courses and class schedule information (potentially from all providers in the state). In addition, employers, community groups, and learners of any age or at any location can post requests regarding their specific learning needs and preferred delivery method (face to face, web, ITV, etc.), and "matches" are then made between the providers and learners.

A coordinating board made up of members of the many stakeholders, two project managers, and a series of task teams have largely led this effort and developed these resources. The Chancellor from one system and the Provost from the other appointed the original board; the co-chairs are the Senior Vice Chancellor from the Minnesota State Colleges and Universities (MnSCU) and a Vice Provost from the University of Minnesota (UMN). Most recently, a business plan has been developed, stating that these online resources represent "a gateway through which citizens seeking access to learning, job and career opportunities; learning resource providers; and employers are drawn together into a dynamic Internet based marketplace that creates value for each of them and the State as a whole."

According to Teare et al.'s (1998) definition of a virtual university, "a virtual university must be a real university offering learning opportunities otherwise denied," Minnesota Virtual University, currently comprised of a comprehensive course catalog, does not represent a "real" virtual university. Instead, what began as a legislative mandate to create a "virtual university" has become a framework for the Minnesota public higher education systems to address joint development of online student systems, curriculum development, faculty and staff development, K-12 connections, transfer issues, industry partnerships, and rapid development of learning resources to meet learner needs. The resources created, an online advising system and comparative course catalog, put the resources of 200+ institutions at the fingertips of lifelong learners. They do not, however, deliver the courses, certificates, modules, or programs. MnVU is not a new degree-granting institution.

Along the way, the respective governing boards, President and Chancellor, other college presidents, and academic deans have been informed about the process, and several hundred administrators, faculty, and staff have been involved in the initiative. However, some are either opposed to this venture or view it as a competition for currently scarce resources.

This opposition could be viewed as an asset instead of a liability. Stephen Downes (1999), in his recent analysis of California Virtual University, writes that

> There is a great danger that online learning will suffer from the (uninformed) promises made by administrators and government officials. Expecting quick financial returns, expecting to be *the* provider of a certain course, program, or service, expecting that staff and students will flock unassisted to the new paradigm; these are all pitfalls into which promoters of online learning sometimes fall, and ironically, sometimes the discipline's greatest proponent can also be its greatest liability. (http://www.atl.ualberta.ca/downes/threads/column041499.htm).

Downes also notes that joint ventures are necessary because they reduce costs and improve usage, but they "do not work unless the institutions work together, sacrificing (apparent short term) gain for future returns." Indeed, a recent planning report in our state stated: "If Minnesota's higher education institutions - both public and private - are to thrive... they need to see themselves as brokers of educational services, rather than as competitors fighting for enrollment and public funds, and they need to work cooperatively to provide affordable services" (*Minnesota Planning, Balancing the Books: Affording College in Minnesota* , May, 1998, p.7).

The citizens of our states, our nation, our world – our learners – expect our systems to partner in providing high quality, affordable, relevant, flexible, and focused programs and services that meet immediate and long-term educational needs. They expect us to leverage our resources in the development of joint systems and services that are designed with the learner at the center. Furthermore, all of us are faced with growing competition from around the world as well as from non-traditional educational organizations.

We have found that faculty, administrators, and staff across our state respond to the MnVU effort generally in one of three ways: (1) tremendous excitement through recognition of the need for institutions to cooperate in developing online programs and resources for learners and a genuine readiness to collaborate with colleagues at other institutions to meet the needs of our citizens; (2) genuine fear that virtual universities and their online resources represent a "second class" form of learning; or (3) a feeling that this represents the next ineffective educational scheme, competition for scarce resources, additional burden without reward, top-down decision forced upon them, or simply the next nuisance keeping them from conducting research.

So, we embarked to meet this mandate without the millions needed to support development of a "full" virtual university. We opted to develop a suite of learner resources through engaging faculty, staff, and people throughout Minnesota who are deeply concerned about the changing role of higher education in meeting the needs of lifelong learners. We worked to develop strong collaborative partnerships so the next phases of our work could be built on a solid organizational foundation. And, we worked to better understand transformative change and the role of change agents.

Our primary purpose is to begin a discussion on identifying criteria for determining if a state (or region) is ready for a virtual university initiative.

In the remainder of this paper

- we share two taxonomies for classifying virtual universities that now dot the higher education landscape;
- we present our initial list of inter-institutional readiness criteria or those criteria that preferably need to be in place, and definitely should be addressed, before beginning a statewide virtual university effort; and
- we describe our key partners and how we have built a statewide partnership for such an endeavor despite the absence of many of these criteria.

Classifying Virtual Universities

"Most industrialized modern societies are now embarked on providing mass higher education and increasingly this is provided through a market system. Education has become a positional 'good' or commodity which people seek to invest in for personal gain. It is also a social 'good' and a means of ensuring equality of opportunity and routes to a better life" (Teare, Davies, & Sandelands, 1998, p. 8).

In the literature, virtual universities have been classified in different ways, such as by the degree of institutional integration (Smith, 1998), organizational structure (Hanna, 1998), governance structure (Hurst, 1998), economic basis and scope (Athey, 1998), and the degree of innovative technology used (Michel, 1998). What follows is an overview of two of these taxonomies as they relate to building a statewide partnership.

Taxonomy based on institutional integration

Smith (1998) focuses on higher education consortia, which are formed to exploit the potential of communications technologies with the ultimate goal of providing "greater scheduling flexibility, greater variety of courses and degrees and better educational value to … students." According to Smith, it is these consortia that will form "the rough outline of future mega-universities." Currently, Smith argues, these future mega-universities can be categorized based on their level of institutional integration. Thus, Smith differentiates between:

- The Course Broker
- The Collaborator
- The Wholesale Purchaser

The Course Broker

Course Broker consortia list course offerings from member institutions, but they do not offer degrees. Consortium members may share the cost of operating the collaborative, but they typically do not share revenues. This level of institutional integration allows for members to avoid controversial issues, such as revenue sharing, scheduling conflicts, admissions criteria, etc. However, this model does not provide a consistent learning experience for learners.

This is the most frequent consortium model at this point; examples, according to Smith, are the Western Governor's University (WGU), Southern Regional Electronic Campus (SREC), the Michigan Virtual Automotive College (MVAC), and the Iowa Communications Network. The current version of Minnesota Virtual University also would fall under this framework.

The Collaborator

Collaborator consortia, according to Smith, form the next higher level of institutional integration. These consortia have curricular, budgetary, and administrative structures that allow for the sharing of courses (typically rarely offered courses, such as certain language courses), costs, and revenues. Smith finds that community college systems are "particularly well positioned" for this model, because they already share standard admissions policies, open enrollment policies, and often statewide standardized degree curricula.

A typical example, according to Smith is the Maryland Community College Teleconsortium (MCCT).

The Wholesale Purchaser

According to Smith, this model exhibits the highest level of institutional integration and is therefore still very rare. Wholesale Purchaser Consortia "'purchase' courses from member institutions, assemble the courses into a degree program and 'resell' the courses and the degree to the distance education student." This model then offers the greatest variety of courses and programs to students while benefiting from the strengths of individual members and competition among members.

Smith did not consider any existing consortium to have reached this level; however, close examples are the Colorado Electronic Community College (CECC) and the part of WGU that offers competency-based degrees.

Taxonomy based on governance structure

Hurst's (1997) taxonomy is directed at colleges and universities to help them evaluate "different structures and governance models for distance learning" in their attempt to meet the new needs for workforce training, retraining, and post-secondary education in general. We highlight this taxonomy as it more closely relates to the different models one might undertake for building a statewide partnership.

Hurst notes that any feature or characteristic of any model can be combined to form yet a different model and therefore provides a set of six scenarios. His scenarios include:

- The Open University
- Governor's University
- Virtual Community College and University
- Institutional Competition and Consumer Advocacy
- Coordinated Collaboration
- Current Structure

The Open University (OU)

The Open University is one possible strategy to satisfy increased demands for learning. However, this strategy involves the creation of a new independent institution, focused solely on distance learning that would compete with existing institutions for students and would not reduce duplication of courses and degrees. No state in the US has currently proposed such an initiative. In our work on MnVU, the leading administrators of our systems have been extremely opposed to such a model.

Governor's University (GU)

A governor's university would broker existing distance learning content in the state and would award degrees based on this content as well as offer student and academic services from this central virtual organization. In contrast to the OU, the GU would not develop its own courses. Hurst claims that this model does not reduce course duplication, either, and might in fact increase duplication due to increased competition among institutions. An example of this model is WGU. Again, in our case, administrators and faculty have been opposed to the development of a virtual university that would award degrees.

Virtual Community College and University (VCCU)

In this model, courses and services will be designed and offered by member institutions, which also award degrees and certificates and thus retain their overall autonomy. While this system offers one-stop degree-shopping and tends to involve less inter-institutional conflict than the GU model, the model does not reduce the duplication of course offerings. Leverage could occur, however, through shared marketing costs. A typical example of this model is California Virtual University (CVU), and in the early states of MnVU, we followed this model.

Institutional Competition and Consumer Advocacy (ICCA)

This model embraces the free market and open competition among all institutions in a state. The ICCA would be a centralized neutral student and employer advocacy organization to provide information, marketing, needs assessment, and standards for academic and student services. This model would preserve institutional autonomy and reduce course duplication, but current institutional structures may prevent rapid response to a free-market approach.

This model currently is the closest to how MnVU has developed. We are, however, facing difficulty as our institutions generally are not ready to engage in the "rapid response" needed.

Coordinated Collaboration (CC)

This model would involve a division of labor, with the public higher education system choosing institutions to be primarily responsible for distance learning. The result would be individual institutions with different missions rather than many institutions with an "add-on mission". Cooperative agreements will be made to meet student and state needs. According to Hurst, this model is likely to reduce duplication of effort, but participating institutions will lose some autonomy.

Given that current discussions underway between our institutions (UM and MnSCU) focus on "mission differentiation," this model may be more appealing to some. For example, MnSCU's community and technical colleges could be the designated leaders in the area of distance learning, and UM could focus its efforts primarily on research on the impact of this effort on learning and economic development in the state. This approach, however, is opposed by those faculty in the UM system who see part of their response to the "land grant mission" as developing distance learning offerings to meet the needs of the citizens of the state. Thus, one could argue that community and technical colleges and universities should partner -- via the MnVU mechanism -- in this effort.

Current Structure (CS)

According to this model, "institutions will continue to develop distance learning courses within their current structure. This model does not reduce duplication of efforts and does not provide any new incentives for reducing costs.

If we are to be most realistic in this article, we would have to say that, given the lack of strong support for MnVU by upper levels of administration and lack of ongoing, adequate support from the legislature most of our state's institutions are continuing to develop distance learning courses within their current structure. We contend that this result stems in large part from the fact that our state was not ready for this initiative; MnVU began as a response to a legislative mandate.

Assessing State Readiness for a Virtual University

Carol Twigg (1999), in her work for the PEW Charitable Trust, has developed a set of "institutional readiness criteria" and "course readiness criteria" for those institutions interested in using technology to increase access, improve the quality of learning, and reduce costs. The set of institutional readiness criteria, in the form of a list of questions, is as follows:

- Does the institution want to control or decrease costs and increase academic productivity?
- Is there a demonstrated commitment on the part of institutional leaders to use technology to achieve strategic academic goals, a commitment that moves beyond using technology to provide general support for all faculty and all courses?
- Is computing firmly integrated into campus culture?
- Does the institution have a mature information technology (IT) organization(s) to support faculty integration of technology into courses? Or does it contract with external providers to provide such support?
- Do a substantial number of the institution's faculty members have an understanding of and some experience with integrating elements of computer-based instruction into courses?
- Does the institution have a demonstrated commitment to learner-centered education?
- Has the institution made a commitment to learner readiness to engage in IT-based courses?
- Is there recognition on the campus that large-scale course redesign using information technology involves a partnership among faculty, IT staff and administrators in both planning and execution? (http://www.center.rpi.edu/PewGrant.html).

These criteria are helpful at the level of the individual institution; that is, they can help an institution determine whether it is ready to engage in a virtual university partnership. We have found, however, that for a statewide partnership effort such as a virtual university, even a group of institutions who are able to respond positively to the above questions may not be able to foster the development of a virtual university as this is also dependent on inter-institutional readiness for such a major initiative.

Scott G. Rosevear (1999), in his comparative case study of eight organizations from higher education, industry, and state governments involved in the development of virtual universities, also argues for the need to assess readiness before developing a virtual university. He has developed the following set of questions to assess readiness:

- What is the state's technological infrastructure?
- How prepared are the traditional colleges and universities to support virtual learning environments?
- Do they all have equal technological capabilities?
- What is a reasonable prediction for how long it will take before the virtual university is operational?
- What are the resources gaps, and how will they be filled?

Rosevear's second question regarding the preparation of colleges and universities to support virtual learning environments most closely aligns with Twigg's institutional criteria. Based on our experience, we would add the following criteria for determining if a state is ready for a virtual university initiative:

- Learner and faculty needs. Are there learning opportunities otherwise denied by existing traditional institutions? Are faculty being denied the opportunity to offer their expertise in innovative ways to the citizens of the state?

- Champions of change. Is there both vertical and horizontal support across the institution and systems? Is there buy-in by the state's institutions and by key departments, programs, and faculty?

Is there the potential for multi-state or regional collaboration and support?

- E-commerce strategy. Does the state have an e-commerce strategy, and does this strategy include an emphasis on lifelong learning (i.e., innovative partnerships between educational institutions and industry)?
- International strategy. Does the state have an international strategy, and does this strategy include an emphasis on lifelong learning (i.e., innovative partnerships in education, the ability to look worldwide for learning opportunities)?
- Identified "crucial" industries and a clear economic development plan. The Michigan Virtual Automotive College began in large part to protect a crucial industry in the state. Has the state identified its most crucial industries to preserve, protect, and foster? The virtual university should preserve, protect, and foster lifelong learning in these industries.
- A climate that supports collaboration. Are incentives in place to foster collaboration across systems? Rosevear's list of criteria includes the need for institutions in the state to have equal technological capabilities. We would argue that in addition to the need for a technological infrastructure, a state needs an environment that encourages and supports collaboration across pubic, private, proprietary, corporate, and other educational systems. The human resource infrastructure and commitment is the greatest need in establishing a statewide virtual university.
- Resources. Is a minimum of five million committed to the initiative? This criterion seems obvious, yet most virtual university efforts have failed simply because they, in reality, did not have the monetary resources to build and sustain such an effort. Rosevear writes about the need to recognize the time it takes before a virtual university can be expected to sustain its operation. We would state that a minimum amount of time to sustain such an effort would be five years; however, most virtual university efforts funded by state legislatures result in a two-year funding commitment along with a large number of people who assume that the resulting virtual university will do everything imaginable for an extremely low price.
- A commitment to learners. Do the state's institutions foster the development of learner-centered systems? So much has been written about the need for learner-centered systems that we hesitate to add this to our list of criteria. However, most institutions focus first on what the virtual university effort brings to them rather than on what it should bring to learners.

We have identified these criteria as we have worked to develop our state's virtual university. In some respects it is like determining when to have a family. If you wait until all your criteria have been met (e.g., enough resources, a large enough home, enough time), you will never do so. Thus, we recommend beginning such an initiative from the standpoint of advancing a partnership. Identify and work with key stakeholders and begin at the level of establishing trust and encouraging large amounts of communication.

Advancing a Partnership Effort

A true partnership is more than cooperating or collaborating: it is a new way of life.

Twenty-four college and university presidents in a recent Kellogg Commission report on the Future of State and Land-Grant Universities (1999) stated that in order to create a "learning society," education should be accessible and promoted to people of all ages. The report specifically suggests that universities partner with elementary and secondary schools, businesses, and governments to increase access and the development of lifelong learning resources.

Despite lacking crucial state readiness criteria, MnVU does represent such a commitment to partnership. The partners that sustain the effort include state agencies, higher education institutions, and private organizations. These partners are:

- Minnesota Association of Private Post-Secondary Schools
- Minnesota Community Education and Training Associations
- Minnesota Department of Children, Families and Learning
- Minnesota Higher Education Services Office
- Private Business and Industry Corporate Training Centers
- Minnesota Office of Technology
- Minnesota Private College Council
- Minnesota State Colleges and Universities
- University of Minnesota

In addition, thirteen task teams made up of faculty, administrators, staff, and people from industry, community groups, and government agencies, worked on the following areas:

- Joint powers agreement
- Legislative request
- Industry partnerships / Rapid response mechanism
- Faculty and staff training and development
- MnVU facilitation (plan for online and face-to-face ongoing feedback mechanism)
- Marketing
- Policy development
- Community partnerships
- Technical tests at cooperating institutions and organizations
- Evaluation
- K-12 Connections
- Minnesota transfer agreement
- UMN and MnSCU distance education collaboration

Lessons Learned Thus Far

We know that characteristics of surviving and thriving organizations in the next century will, above all, include the capacity to develop, maintain and profit from working in strategic, collaborative relationships. Organizations must come together for strategic purposes to accomplish specified and often highly specialized tasks or goals. Our institutions must bring together the best team members to accomplish the tasks in a flexible and highly responsive nature. While higher education continues to increase in complexity, specialization, and bureaucracy; thriving institutions of the future will be required to accomplish focused and targeted goals in more rapid timeframes than ever before and within a context of fewer public resources.

In order to meet the needs of rapid response in complex setting, we must partner in new and unique ways. This requires leadership skills that include "thinking in the future tense," a strategic context described by Jennifer James (1997). It requires that we come together in strategic alliances which can meet the divergent needs, provide added value the process, and maximize the use of both human and fiscal resources.

However, universities are particularly difficult to move towards lasting partnerships. This is due to the fact that they are highly complex and they exhibit organizational connections that lack cohesion of purpose, which may better be described as "organized anarchy." The lack of cohesion in universities is frequently attributed to goals that are often ambiguous, unclear and diffuse. This is due to multiple levels of authority and control from faculty within departments, departments within colleges, and colleges within universities. Hutchins (1968) suggests that the only thing connecting a university is a central heating system, and Giamatti (1979) proposed that a university was less an ecosystem than a swamp.

Perhaps the greatest single factor distinguishing between universities and other types of organizations is related to authority and power relationships. The university has what has been described as a "fluid and amorphous" decision making structure. It is a reflection of a large number of participants in the process and "hundreds of largely autonomous actions taken for different reasons, at different times, under different circumstances by different people." The greatest challenge is how to get everyone in on the act and still get action. (Robinson & Daigle, 1999, p. 6).

Brandenburg and Nalebuff (1996) describe a new way of operating as "co-opetition" which is characterized by the following:

- Customers valuing what partners do together more than what they do individually.
- Suppliers finding it more attractive to supply to both individuals (or institutions) instead of individually.
- Supply-side complementarities becoming the norm.
- Institutions thinking how they might complement each other and maximize the use of resources and delivery of services.
- Institutions as recognizing each other as equal partners in creating more value for customers.

This reflects a very new way of approaching the way organizations approach business. It is particularly difficult for higher education because a majority of people in higher education do not think in terms of cooperation, collaboration, partnerships, or co-opetition. Academe is still the strong hold of individual quests for knowledge.

Despite again what appears as obvious, Robinson and Daigle (1999), in their article on the factors that affected California State University's innovative technology initiative, conclude that factors underlying public-private partnerships such as the one in California are fragile at best:

> The probability of success is dependent on many factors… the basic premise is that a university's preparation or readiness prior to a partnership initiation is the single most important contributor to such success…Public institutions must change in fundamental ways before courting private partners, not during or after that process has begun. A long hard look in the mirror prior to partnership development will prepare an institution for dealing with the structural barriers to its success. (p. 4).

This reflects the important lesson of understanding what partnering means, particularly across significantly different organizations such as public and private entities.

Robinson and Daigle (1999) list the following features common to successful partnerships:

- The partnership provides for efficiencies in terms of being able to do more with less.
- The partnership expands the resource base of all partners, often through access to resources of a highly specialized nature.
- The partnership offers flexibility for meeting changing needs and conditions.
- The partnership provides for new ventures not otherwise possible or leveraging assets and capabilities to take advantage of sudden opportunities.
- The partnership allows for risk sharing. By pooling risks, organizations may be more likely to take them in the first place.
- The partnership speeds up the process of innovation in products or services again by polling expertise and resources; keeping current is particularly important in the area of information technology.

And they go on to attribute failure of the public private partnership in California to:

- The inability of CSU and prospective partners to meet their respective financial objectives or to develop a mutually acceptable distribution of risk.
- An inadequate appreciation on the part of all partners of the preparation required to engage in a partnership. (p. 8).

As Robinson and Daigle (1999) note, the desire to increase institutional resources and conduct business differently is a necessary condition but not adequate in itself to form a successful inter-institutional partnership. Each university, each partner, must prepare in advance before attempting to form a virtual university to help determine if it is able to engage in such a relationship (p.8). The potential that a virtual university partnership holds can be realized, and risks of failure reduced only if all parties to the partnership take important steps to establish trust, communicate openly, and assess state and institutional readiness from a variety of perspectives.

So, how does one best advance a virtual university partnership?

Based on our experience thus far, we know that a virtual university initiative needs a vision as well as leadership committed to a future that cannot be perfectly defined. It needs the support to allow it to grow toward a future that is continuously articulated; it needs the flexibility to jump on opportunities that arise during its development and implementation. To jump start such an initiative, you need agreement on clear goals and principles, a commitment to collaboration, acceptance of creative partnerships, and champions at multiple levels who are provided with the time and support to succeed.

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Abstract

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Title: UCF's Support for Teaching and Learning Online: CD-ROM Development, Faculty Development, and Statewide Training

Author: Barbara Truman-Davis, Linda Futch, Kelvin Thompson, Francisca Yonekura

Organization: University of Central Florida

Year: 1999

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UCF's Support for Teaching and Learning Online: CD-ROM Development, Faculty Development, and Statewide Training

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Abstract

The University of Central Florida has developed an award winning faculty development program providing experiential, collaborative learning for instructors to build online programs. A project is now underway to extend training throughout the State of Florida. Supporting students is also essential to the success of teaching online. The Pegasus Connections Disc provides software tools, tutorials and just-in-time information for all incoming UCF students and faculty. Lessons learned and evaluation data will be shared.

UCF's Support for Teaching and Learning Online: CD-ROM Development, Faculty Development, and Statewide Training

The University of Central Florida began an intensive faculty development program in the summer of 1996 to systematically teach faculty how to create interactive learning environments for online delivery. As the faculty development program matured, the delivery format modeled teaching with technology in the form of a simulation course. Since 1996, more than 180 faculty from all five of UCF's colleges have been involved in the faculty development program called IDL6543: Interactive Distributed Learning for Technology-Mediated Course Delivery.

The IDL6543 class is a result of an institutional approach to developing online learning to meet the needs of a rapidly growing campus with many nontraditional students. Faculty participating in IDL6543 receive financial incentives, course development support, and assessment support to make their first attempts in teaching online successful. Participating faculty become part of an interdisciplinary learning community that leads to peer teaching as "Web Veterans." Over 400 courses have been developed through the IDL6543 class. In November 1998, UCF was named one of five best practice institutions in North America in preparing faculty to teach with technology. The American Productivity and Quality Center and the State Higher Education Executive Officers conducted this benchmarking study. UCF also has a comprehensive research initiative that evaluates UCF's online courses.

This paper describes four areas of readiness: institutional, faculty, course development, and learner readiness that contribute to UCF's comprehensive approach to development and support of online learning. UCF's experience is now being extended to other institutions in Florida through a statewide training project.

Institutional Readiness

As institutions move into technology-mediated learning, increasing learning outcomes while designing for scale and controlling costs are issues that must be reconciled. Faculty satisfaction is a by product of institutional support and student satisfaction and achievement. Three units were created within the last three years to specifically support UCF's online initiatives. Course Development and Web Services (CD&WS http://reach.ucf.edu/~coursdev) creates and conducts faculty development and course production. The Center for Distributed Learning (CDL http://distrib.ucf.edu) provides campus-wide coordination, planning, marketing, and administrative support for program development. The Research Initiative for Teaching Effectiveness (RITE http://reach.ucf.edu/~research) was created to provide assessment of online courses to support faculty and course development. Since the creation of these three units, online learning has become institutionalized at UCF. Favorable conditions for institutionalization at UCF occurred due to the compatibility of online learning with the following:

Good fit with the character and mission of the institution
Good fit with learner characteristics of the institution
Clear articulated mission and strategic plan
Demonstrated level of faculty interest
Robust campus infrastructure

- Ubiquitous, universal access to computing
- Redundant, reliable network services
- Well-equipped campus labs
- Coordinated technical sales and support

Distance or distributed learning leadership

- Articulated vision and doctrine of shared vision from top administration
- Core organizational structure
- Planned growth
- Campus-wide coordination
- Internal and external partnerships
- Buy-in by academic leadership

Commitment to faculty support

- Incentives and rewards
- Systematic faculty development
- Research design and analysis support
- Tenure and promotion reconsideration
- Policy development

Commitment to course and program support

- Design for scale
- Quality standards development
- Multimedia production support
- Research and development
- Copyright support

Commitment to learner support

- 7 x 24 help desk support
- Communication and marketing
- Metacognition support
- Flexible tutoring and advising

- Orientation
- Adequate software
- Web-based campus services

Commitment to assessment

- Insuring quality of programs
- Research mission support
- Alternative assessment creation

UCF's Impact Evaluation

UCF has collected data since 1996 on the impact of our classes that are supported though our IDL6543 faculty development program. Support for evaluation has resulted in a coordinated approach to collecting data about student and faculty demographics, student learning styles, growth in enrollment and sections, student and faculty perceptions of teaching and learning online, and problems encountered while teaching and learning in the online environment. These evaluation data have been used to target improvements in faculty development, learner support, and technical support needed by faculty and students. Over the past year, learning styles of students in the online courses have been studied with the intention of helping faculty address the needs of different learning styles they will encounter in their classes. Plans are to enable students to determine their own learning styles and make informed choices about the types of courses they select as part of their college education. Faculty participating in the IDL6543 program have an opportunity to receive expert research design assistance in addition to support for collecting, analyzing, and publishing evaluation results. Drs. Chuck Dziuban and Patsy Moskal of the newly created Research Initiative for Teaching Effectiveness (RITE) have pioneered UCF's assessment efforts in online learning. For more information see http://reach.ucf.edu/~research.

Faculty Readiness

Use of the Internet has become so pervasive in society and on campus that faculty are facing pressure by their students to provide some form of Web presence to facilitate and complement learning. More mainstream faculty are looking for support for teaching with the Web as online course offerings are expected from students.

In our experience, mainstream faculty who have the greatest ease in transitioning to the online environment in teaching possess certain attitudes. Once faculty understand the online course development process and delivery differences, future development time and delivery time are reduced enabling transformation of more courses that are taught by that faculty member. The faculty attitudes conducive to adapting to the cultural change of online learning are:

- Genuine motivation to learn
- Willingness to lose some control over class design and teaching
- Ability to team with other experts
- Adaptation to the necessary change in role
- Ability to build a support system
- Patience with technology
- Ability to learn from others

A desire for online learning has manifest itself at UCF by the unprecedented demand for learning WebCT (an online course management tool). As of the summer of 1997 when UCF purchased WebCT, there has been an increase in accounts from 40 to 800. The nature of teaching and learning online requires a set of essential skills and knowledge. Not every faculty member is interested nor equipped to teach online. A combination of skills and willingness to adapt to the cultural change are required. Faculty who plan to teach online must prepare for their change in role and also plan for the change in role required for their students.

In addition, faculty interested in teaching online must possess or acquire sufficient computer and Internet skills. In order to achieve the adequate skill set to teach online, faculty will need institutional support as well as technical and professional development support. At the University of Central Florida, faculty interested in teaching fully web-based (W) or media-enhanced (M) courses may participate in a request for proposal (RFP) process, from which grants are awarded to develop and teaching online courses.

A New Approach for Faculty Development - IDL6543

The IDL6543 faculty development model for online teaching is an outgrowth of sound pedagogical philosophy and institutional support. IDL6543 is a faculty development program designed to create interactive online environments to support mainstream faculty as well as early adopters and innovators. A course approach was designed to create collaboration and experiential learning. As faculty go through IDL6543, they build activities and web pages for use in their courses. Participants in IDL6543 are given a new computer, release time, and course design and production support to develop and deliver their course. Faculty are required to participate in the IDL6543 faculty development program and work with staff from the Course Development and Web Services (CD&WS) unit to design and develop their online course materials. CD&WS was created to support the IDL6543 faculty development program and has teams of instructional and digital media designers, programmers called "Techrangers," and software engineers to assist with course production support. As of September 1999, approximately 180 UCF faculty have been involved in the IDL6543 faculty development initiative, resulting in the creation of over 400 courses that involve using online techniques. Approximately 350 faculty have received support from CD&WS since summer 1996. In the fall of 1997, UCF adopted the use of WebCT an online course management tool. Today, there are over 800 WebCT accounts in use at UCF with over 30,000 registered users in these accounts.

Faculty attending IDL6543 report being rejuvenated in their teaching. Each semester approximately 30 faculty from various disciplines become involved, resulting in an instructional model that builds on itself through peer teaching. This development cycle creates an upward spiral that allows the instructional model to continuously improve over time. Instructional designers from CD&WS act as change agents to facilitate building a cultural change across disciplines for faculty with varying levels of technological ability and experience.

The IDL6543 curriculum breaks down into approximately 60 hours of required time for average participants to become successful. Five classes: 15 hours, five labs: 7.5 hours, ten online modules: 30 hours, and consultations with instructional designers for needs assessment and development: 7.5 hours. Total: 60 hours. To date, class participants have included faculty from all five UCF colleges, several doctoral students, faculty from the Florida High School, two from the Naval Air Warfare Command Training Systems Division (NAWCTSD), and one person from STRICOM (US Army). For more information about IDL6543 see http://reach.ucf.edu/~idl6543.

Institutionalizing faculty development for online learning has provided benefits including:

- Creates experiential learning for faculty participants
- Enables cross-discipline sharing of teaching techniques
- Builds learning communities among faculty
- Creates lifelong learners among faculty
- Creates discussion of the teaching and learning process
- Allows peer evaluation of successes and failures
- Exposes faculty to tools and instructional best practices
- Models a combination of delivery techniques
- Uses cooperative and collaborative learning techniques
- Provides greater flexibility for busy faculty
- Transforms all teaching for more active learning delivery

Rapid development and adoption of web-based learning has occurred over the last three years at UCF requiring support staff to innovate operations to meet the needs of the entire campus. The combination of factors such as: student needs, innovative faculty willing to take risks, and a campus culture where institutional support has enabled broad support in using technology for teaching have led to this rapid change. Systematic faculty development, comprehensive learner support, and attention to assessing new learning environments have allowed more faculty to participate and succeed in the online environment. The use of WebCT as a standard course management tool with so many features has been an important factor in the success of UCF's online programs. Professional development such as WebCT Academy will allow more UCF faculty and students participate in web-based instruction.

Course Readiness

Online course delivery does not necessitate delivery of content by online means alone. UCF employs a multitude of delivery strategies to delivery content and increase interactivity in courses. CD&WS produces CD-ROMs, print materials and videos to augment online courses. Online resources are the primary means of course delivery. Use of mixed mode deliveries and media enable more courses to be delivered appropriately online. UCF's investment in course development and production support has enabled course readiness for many programs.

Participants in the IDL6543 faculty development course learn both a standard process and receive standard elements to incorporate in developing online courses. This adherence to standards does not stifle the creativity of the instructor or of the support staff. Rather, the use of a standard process and of standard elements creates course readiness.

Development of a Course--The Process

WebCT Academy--Course Development & Web Services has developed a comprehensive curriculum for training faculty and graduate teaching assistants to use the course management tool adopted by UCF (WebCT). Participants in these six sessions learn the mechanics of managing an online course, and they are also presented with an array of best practice strategies from which they may choose to incorporate into their course. The first two sessions of WebCT Academy are required as prerequisites to IDL6543. The third and fourth sessions are taken as lab sessions during IDL6543, and the last two sessions may be taken after completing IDL6543. For more information see http://reach.ucf.edu/~webct411.

Initial Interview for Determining Faculty and Course Readiness

Prior to beginning IDL6543, instructional designers meet with faculty participants in an initial needs assessment interview. Along with providing valuable insights into the faculty member's instructional preferences, technology skills, and course characteristics, this interview provides the foundation of a relationship that will continue throughout and long after the IDL6543 course. The instructional designer becomes a coach to the faculty member developing an online course. The instructional designer must conceptualize the faculty member's vision for the course and guide him or her in incorporating appropriate instructional strategies and media as the course is developed.

IDL6543 Process of Development

Imagine a duck floating serenely on a pond while paddling like crazy beneath the surface. This metaphor can be applied to the IDL6543 process. Some faculty begin the IDL6543 course with an expectation that they will "get some web pages created." Others come expecting to "learn how to use WebCT." A smaller group wants to "learn how to teach online." The three dimensions: creating course materials, learning technological skills, and developing instructional strategies are important; each is addressed in IDL6543.

Returning to the duck metaphor, it can be seen that an online course has certain observable components; namely, the actual online web pages. This observable dimension is not unlike the duck floating calmly on the pond. This is all that the casual observer notices. Underneath the water's surface, however, two rapidly paddling webbed feet perform the work. One of these feet is the technological skill set developed by the participants, while the other is the knowledge base of pedagogical strategies that is formed. Emphasizing only one of these dimensions (just the technology or just the pedagogy) will result in a "one-legged duck swimming aorund in circles." Emphasizing only the logistics of producing web pages without supporting technological and pedagogical skills results in what can only be termed as a "dead duck."

The emphasis in IDL6543 on all three areas moves a developing course toward readiness. Technology skills needed for teaching online are taught. Pedagogical issues, models, and strategies are discussed. Finally, the faculty participants, instructional designers, and production team work together to produce the actual online course materials.

Specifically, the following topics are addressed in each of these three areas:

Technology

- WebCT course management skills
- Accessing electronic library resources (for course materials and for student assignments)
- Advanced e-mail techniques for automating certain course management functions
- Dealing with technology problems (simulated scenarios)

Pedagogy

- Overview of Distributed and Asynchronous Learning
- Instructional Best Practices - Using Technologies
- Systematic Instructional Design Process (Instructional Strategies)
- Distributed Learning Course Development Process
- Interaction in Online Courses
- Assessment in Online Courses
- Course Administration
- Group Work in Online Courses
- Copyright & Fair Use
- Learner Support

Logistics

- Overview of course production process
- Accessing online library resources for content development
- Submission of materials (in electronic format) to instructional designer
- Review and editing suggestions by instructional designer
- Re-submission of materials by faculty member
- Coding of web pages
- Review of materials by faculty member and instructional designer

Production

At the conclusion of the IDL6543 course, each participant walks away with all of the publicly accessible web pages created and posted online, the WebCT communication tools configured for the specific strategies to be used, and one module of content in place. The content modules are based on a specific course objective, require student interaction, and are paired with an assessment. The faculty member also has created a "course management plan" with which he or she has scheduled the remainder of the course content production.

Course content typically takes the form of web sites created by Techranger programmers and digital media designers. Design element graphics (i.e., graphical frames, buttons, bars, and bullets) follow one particular "look" for each course. These graphics form a number of "templates" from which the faculty member chooses at the beginning of IDL6543. A course-specific graphical header is created for each online course that visually communicates the key concept(s) of the course (e.g., the header graphic for a "social problems" course incorporates images of police officers restraining a violent person, a homeless person, and picket signs displaying various slogans related to social issues).

Dynamic media elements and interactive content elements may also be created by Techrangers and software engineers as necessary for particularly crucial concepts in the course (e.g., a "women's health issues" course incorporates a personal health assessment form in which students enter their lifestyle habits and receive a personal "health rating.")

An ongoing dialogue between the faculty member and instructional designer is conducted throughout the course development process. The instructional designer continues to play the role of coach to the faculty member, but also serves as primary liaison between the faculty member and the production team. The "course management plan" is used to ensure completion of all course materials prior to the start of the first semester the course is offered. Each subsequent semester the course is offered, the faculty member and instructional designer work to revise the course materials based on the experiences of the preceding semester and on emerging strategies, technologies, and assessment results.

Course Components (The Elements)

UCF's online course model consists of two major components: publicly accessible web pages and a password protected pages within the WebCT course management tool. This can be conceptualized as a house with a front porch. Only the people who live in the house have a key to get into the house, but the porch isn't locked. Anyone can stroll up the sidewalk and sit on the porch.

The publicly accessible web pages combine to form a comprehensive online syllabus. These pages convey the direction of the course and the personality of the instructor. The public pages are helpful to students who are shopping for a course, particularly for those students who will never "meet" the instructor in person. Although these pages are professional in appearance, an effort is made to adopt a welcoming, informal tone. Many pages are written in the first person voice. All of the publicly accessible pages for UCF's centrally supported online courses are housed on one web server called the Reach Server. (See http://reach.ucf.edu.) The standard web page convention allows easy student access for all supported online courses.

Although the exact number and titles of standard public pages and buttons varies according to instructor preference, the typical pages and their descriptions appear below:

Course home

- Course description
- Learner-centered objectives
- What you expect from the learner
- What the learner can expect from you

Schedule

Generally this is offered as an individual page for ease of reference, printing, and navigation. It links directly to course content and or assignments for a specified due date.

Protocols

This page contains specific instructions for how communications such as e-mail and the conferencing forum are to be conducted. Subject heading preferences, frequency, and style are some of the issues typically addressed in Protocols.

Syllabus

Note that " Course Home," "Schedule," and "Protocols" are distinct documents. "Syllabus" contains the course-related information found in a traditional syllabus minus the content found in the above three documents.

The password-protected portion of the course within WebCT is where interaction takes place between students and the instructor and where any sensitive online content is accessed. "Content" may take the form of instructor-prepared notes (may replace or supplement textbooks) and specifically designed course activities. Instructional designers work with faculty members to design activities that are based on course objectives and result in realistic assessments.

An attempt is made to include instructional strategies and tools that make online content as interactive as possible. Students who are reading online text in WebCT can use a feature that allows them to write their own notes on each content section, much as one would make marginal notes in a book. These notes are viewable only by the student (and the instructor) and can be compiled and printed for review. Interactive questions can also be embedded into the text so that the student can quickly check his or her understanding of the concept being discussed. The online environment fits particularly well with instructors who wish to guide students in finding their own content in a constructivist approach.

Some course concepts may require the creation of media elements beyond basic text and graphics. High instructional value validates creation of these more complex media elements and the expenditure of resources required for their creation. Deciding what "instructional value" means in a particular course is a task that the faculty member and the instructional designer share and agree upon.

As a means of promoting community building in online courses, a password-protected database called the "Student List" is used to supplement WebCT. Students may enter biographical information and choose to display either their student identification card photo or a cartoon caricature to help other students and the instructor get to know them. Students' preferred e-mail addresses can also be entered so that students and instructor can easily e-mail some or all of the class members.

Each semester, student information is automatically uploaded to both WebCT and Student List databases so that students can "get in" to their course as soon as possible. This automated database population does not require faculty to manually enter information for each student in every course.

Getting an online course ready to become an engaging learning environment is a time-consuming and demanding process, but working together, faculty members, instructional designers, and support staff make online course delivery possible for students.

Learner Readiness:

Many students enter online courses with insufficient computer skills, low metacognitive skills, and ignorance about the kind of course they are entering. In our experience, students are most successful in online classes when they have the following characteristics:

- Informed self selection
- Responsibility for their own learning
- An access plan for taking the course
- Know how they learn (metacognition)
- Have necessary technical skills
- Know how to build a support system
- Respond favorably to technological uncertainties

To create learner readiness UCF has developed or is in the process of developing several products.

Pegasus Connections Disc

Since the beginning of online courses at UCF, faculty members found themselves spending the first few weeks of class dealing with technical issues rather than course content. Most of the technical issues were the result of students' weak technical skills and lack of adequate software. Students did not know how to:

- Access the Internet

- Search the Internet
- Use E-mail and create attachments
- Use word processing programs
- Access their course
- Use WebCT
- Trouble-shoot computer problems
- Trouble-shoot Internet connection problems
- Download and install software programs and or plug-ins

The Pegasus Connections Disc was developed to address these issues. The disc contains numerous tutorials to provide students with technical skills ranging from an introduction to computers to how to log into their course and use WebCT. Students may use the disc to learn new skills, improve existing skills, or check their knowledge. The tutorials include QuickTime movies, self-check quizzes, and practice exercises. In addition, many faculty members assign the practice exercises from the tutorials as a beginning assignment to test the skill levels of their students.

The Disc also includes software tools, plug-ins, and just-in-time information. The software tools include programs frequently used on campus as well as programs and plugins used in classes and in the library. For those students living at a distance from campus, the just-in-time information provides contact information for campus facilities, financial aid forms, and many other forms and information of use to students. The just-in-time information brings services to students at a distance and promotes the feeling of being part of the campus community. Informal demonstrations of The Pegasus Connections Disc for faculty led to the distribution of the Disc to all incoming students and faculty at UCF. For more information see http://reach.ucf.edu/~coursdev/cdrom.

Learning Online Web Site

Prior to the Pegasus Connections Disc, a Learning Online web site was created as a resource for online courses. The Learning Online web site provides guidelines for taking online courses including computer specifications, password information, skill requirements, tips on metacognition, and information. Since the web site was created prior to the Pegasus Connections Disc, some of the information is duplicated between the two resources. As a result, UCF is the process of redesigning the Learning Online site located at http://reach.ucf.edu/~coursdev/learning.

The next version of the Learning Online web site will include three sections:

> **Section 1** - Metacognition for improved self selection. Consistently, our research shows that successful students in online courses are self-motivated, well organized, and have highly developed metacognitive skills. Students who do not have strong metacognitive skills cannot identify when they need help and can become lost without face-to-face interaction with the instructors. Section 1 will include a place for "student self-selection" to determine if their learning style is appropriate for an online course and whether or not they should enroll in an online course. Also, metacognitive tips will be expanded to assist students in getting the most from online courses. Computer specifications will be outlined so the students may determine if they have the appropriate equipment.
>
> **Section 2** -Getting ready to learn. Once a student has registered for an online course, section 2 covers tips on how to get ready. A list of required skills will be included with directions to the Pegasus Connections Disc for tutorials. Also, section 2 will include a timeline that graphically displays what a student can expect during an online course. The timeline will highlight preliminary preparations for an online course as well as the significant events that occur in all online courses.
>
> **Section 3** - Online resources. For students already in online courses, section 3 will be a list of online resources accessible to them at UCF. Links will be included to the library, dictionaries, thesaurus, netiquette, how to create references, and other online services available at UCF.

Student Expectations

Initially students approached course web pages with caution. They asked, "Why do I have to go to a web page for your course? Why don't you provide me with a copy of this information?" Research at UCF shows that student opinions are changing. Now students say, "Why don't you have a web page? I don't want to keep up with this paper, it's easier to access it on the Internet."

As student's technological expectations change, they place new requirements on institutions and faculty. At the same time, students' technological knowledge is increasing perhaps changing the level of student readiness.

Statewide Training Grant

UCF's Course Development & Web Services unit received a grant to extend its curriculum development to others institutions in the state. Florida has an articulation agreement with its community colleges enabling all students receiving AA degrees to be admitted in any of the 10 state universities. Florida also has a statewide license for WebCT enabling all 38 public institutions of higher education to purchase WebCT at a reduced rate.

The statewide training grant will support the development of training materials for the use of WebCT for online learning. A CD-ROM containing tutorials is in development along with print manuals, a practice online course, and a video tape. These materials will be delivered in fall of 1999 through statewide training events. For more information see: http://reach.ucf.edu/~coursdev/webct.

Summary

UCF has institutionalized online learning into the core of the university. The convergence of institutional, faculty, course development, and learner readiness has helped UCF's faculty and students successful in teaching and learning online. As more research is conducted on UCF's efforts to mature its faculty development and online programs, models will be refined to incorporate best practices throughout the institution and the state.

EDUCAUSE Information Resources Library

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Abstract

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ID Number:	EDU9905
Title:	Unified Information Access for the 21st Century: A Project of The California State University
Author:	Doug Davis, Marvin Pollard, Gordon Smith
Organization:	California State University
Year:	1999
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UNIFIED INFORMATION ACCESS FOR THE 21ST CENTURY: A PROJECT OF THE CALIFORNIA STATE UNIVERSITY

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Abstract

This paper presents the results of a three year project of the twenty-two libraries of the California State University system to create an entirely new approach to information access. The Unified Information Access System (UIAS) is designed to provide integrated, single-search access to the full range of library information resources. In addition to creating a powerful information access tool, it incorporates customized guidance in navigating the information environment, making it a valuable educational resource as well as an effective access management tool for librarians.

Background

In 1994 the twenty-two libraries of the California State University produced a comprehensive strategic plan to prepare for the educational and information environments anticipated for the 21st Century. That plan, titled *Transforming CSU Libraries for the 21st Century* identified, as its first and foremost strategy, a system of linking and integrating for easy access the full range of information resources available in all the CSU and other libraries as well as resources of the Internet.[1] CSU libraries were facing frozen or declining budgets combined with prodigious increases in the rate of publication and in access methods to the expanding information cosmos. A new and innovative use of technology was seen as necessary to leverage the size of the CSU information resources in order to continue to meet the needs of students and faculty.

The Unified Information Access System (UIAS) initiative that arose from this strategic planning responds to a vision for the 21st Century that assumes that CSU students and faculty will interact with each other and with information using an Internet environment that enables every student and every faculty member to access, retrieve, display, and manipulate a vast array of recorded knowledge and information. The barriers of space--physical location of student, faculty member, or information--are expected to disappear, as well as the barrier of time.

Conceptualizing the UIAS

While our vision for UIAS was well developed in general terms, a great deal of work lay ahead in defining unified information access and determining its feasibility given the state of available technology in CSU libraries and the library automation industry. We formed a systemwide project team composed of representatives of CSU libraries, multimedia centers, computer centers and the systemwide

Chancellor's Office. The firm of RMG Consultants, Inc. was hired to assist in conceptualizing the UIAS and to serve as our intermediary with the library automation vendor community. At project start-up in the spring of 1995 the team held two meetings of the entire group in which the basic UIAS system was envisioned.

In envisioning the UIAS interface the project team focused on the end-user's point of view, particularly that of the emerging university student. We knew that the students of the near future would have grown up using a computer. Their experience using the Web and at least a vague understanding of the Internet and how it provided anytime anywhere access to vast information resources was also considered a given. We assumed they would want everything and want it now. On the other hand, we realized as professional librarians, that the majority of the content of the Web was not reliable scholarly information. We considered it vital that higher education students use a variety of databases that index numerous formats of recorded knowledge to get the best sources of scholarly information for any given topic. The challenge became how to create an interface that would give them just that. That is, let them do a single search in a Web interface and retrieve relevant books, journals in print or online format, Web resources and multimedia. We established this goal as a realistic one in terms of our general expectations as to how information technology would develop over the next several years.

Having set the general goal, we saw it as essential that we establish a dialog with leading library automation vendors to determine if they shared our vision. The development of UIAS would require vendors to share our vision for the project and be willing to develop the necessary software to implement it. RMG arranged an extensive series of meetings for the project team with about a dozen library automation vendors at ALA conferences in January and June 1995 and January 1996. Many vendors agreed strongly with the concept of UIAS. They tended to support open standards for its development and respected the fact that CSU libraries currently used several vendors for their integrated library systems. There was a mixed reaction to our position that this sort of advanced functionality should be developed in a Web browser rather than a proprietary client, as vendors were putting considerable effort into such clients at the time. Still, we were convinced that a Web interface was essential since Web browsers were widely available for free, already handled full text and multimedia, and would continue to develop rapidly. As the meetings progressed, vendors came to agree with us on this point and also assured us that they were developing suitable Z39.50 server and client software. Standards for ILL, intercampus circulation and authentication were more uncertain, but vendors stated they were willing to develop software for standards in these areas when they were adopted.

Overall, the vendor discussions affirmed wide interest and support for the UIAS concept and were very positive. RMG Consultants submitted their report concluding, based on discussions with vendors and examination of CSU library automated systems, that UIAS was indeed feasible and attainable within technical and budgetary constraints.[2] The report contained a proposed architecture for the UIAS and outlined a Request for Proposals (RFP) process as an implementation strategy.

By this time the project team had conceptualized the elements of a UIAS system in some detail. A user would make a single search from a standard Web browser to obtain information resources in books, periodicals, reference works, and online sources including Web sites and government publications. A bibliographic search that would have taken most of a day in printed indexes a decade ago, or a few hours in several online databases, is completed in about a minute. The search results feature optimized retrieval tools for each type of resource. Online sources are accessible by hypertext links to the full document file. Local books and periodical sources have call numbers and easy print options. The union catalog's combined holdings of the CSU libraries are obtained by direct end-user borrowing, and other materials not in the local library are attainable with interlibrary loan or document delivery request forms.

UIAS system response to a search request by the end-user is summarized as follows. The search is submitted from a Web browser on a form sent to a unified access gateway server (UGS). The UGS converts the search into a Z39.50 client request for broadcast to multiple Z39.50 servers. These servers can be a local library's OPAC; union catalog servers, including the project's union catalog server; commercial index, abstract or full text database servers; government document servers; or a Web search index. The UGS will be a campus-based server and will permit each CSU library to select, by multiple profiles, the database servers to which each user's search request is broadcast in Z39.50 protocol. The

UGS then receives the results in Z39.50 protocol, formats them for effective utilization by the end-user using CGI/JAVA scripts, and transmits the results to the end-user's workstation.

The CSU Council of Library Directors (COLD) analyzed the project concept in September 1995 and decided that an RFP should be developed for providing each CSU library with a UGS and establishing a CSU Union catalog with a Z39.50 server. The development of the RFP was assigned to task forces to write functional requirements for the UGS server including user authorization, broadcast searching and document delivery features, and for the union catalog server including cataloging and mutual borrowing capabilities. Developing the option for Z39.50 server access in a wide range of existing and potential systemwide licensing agreements for bibliographic, abstract and full text databases was also seen as essential. The existing CSU Electronic Access to Resources Committee (EAR) was given this assignment by COLD.

The task forces were constituted as subgroups the UIAS project team; they were charged with reviewing the results of the initial request for information from vendors and do other fact finding as needed to draft their documents. They were to develop functional requirements, an evaluation process and an implementation schedule for the procurement of twenty-two campus-based gateway servers and the central union catalog system. Their work was concluded by mid-December 1995.

The UGS task force developed functional requirements with many key features for the UGS server. The UGS will support users with a single easy to use search interface accessible via Web clients for which it is an HTTP server. The UGS is also a Z39.50 V3.0 client for access to multiple databases mounted on Z39.50 servers. Return of uniform search results from certain non-Z39.50 database servers such as a Web search engine should be considered. It must be capable of searching both predetermined and user-selected groups of databases based on a single user request. The UGS must also support user authorization, end-user ILL and interlibrary borrowing requests, and unmediated document delivery. Ease of use of all its features by end-users must be considered. The UGS must use open standards to the maximum feasible degree for interoperability.

In parallel the functional requirements were developed for the Z39.50 union catalog database server (UC) containing the combined holdings of the CSU libraries. The UC was required to have a Z39.50 V3.0 database server. At a minimum, this would permit it to respond to search requests with listings of which CSU campuses have a given title. The campus OPAC(s) will then be queried by Z39.50 regarding item availability and the request placed at a local campus showing availability. The database could be developed from existing CSU union catalog archive tapes, or by a merge of all campus OPAC databases. The database could be maintained by real time online updates, or by batch processing at frequent intervals of online updates to a transaction file. It will also handle inter-CSU library ILL requests. It may also be used as a common database for cataloging. All of these capabilities could mean its use would reduce other ongoing costs.

The UIAS project was made one of the first wave of CSU systemwide Integrated Technology Strategy initiatives and received funding in Spring 1996. In June of 1996 the chair of COLD and the UIAS project team met to discuss the next steps to be taken. The responsibilities of the project team devolved to three implementation teams: a management team to plan for ongoing operation of the UIAS, an evaluation team to select the vendor, and a contract negotiation team to oversee development of the contract with the UIAS vendor. COLD also appointed project liaisons at each campus.

Selecting the Development Partner

A Request for Proposal was issued with responses due August 23, 1996.[3] Ten vendors responded to the RFP. The ten vendors were Ameritech Library Services, Auto-Graphics, CARL, Data Research Associates, Endeavor Information Systems, Geac, Innovative Interfaces, Library Corporation, OCLC and VTLS. The following month the evaluation team reviewed these proposals and made a selection of finalists. Finalists were Ameritech Library Services, CARL, Data Research Associates, Innovative Interfaces and OCLC. The finalists participated in confidential discussions with the evaluation team in October 1996 and provided demonstration servers for review by the campus liaisons whose comments were solicited by the evaluation team.

Each finalist was then asked to prepare a best and final offer (BFO). The evaluation team met in February 1997 and reviewed these documents. Present at the meeting was the newly hired full time UIAS project manager. The results of the two day meeting were presented in a report issued by the evaluation team. The report recommended that contract negotiations should begin with Ameritech based on the Ameritech BFO having the best overall rating as established by the agreed-upon evaluation criteria. This resulted in the contract negotiation team commencing talks with Ameritech.

The contract with Ameritech was in negotiation for about five months. Since it was for a developmental product, the timeline for its completion and the exact steps needed to combine and enhance a number of existing Ameritech products to make a functioning UIAS system was complex. The contract was signed in July 1997 and the name *Pharos* was selected as the new name for the system in its public manifestation.

The main CSU liaison to Ameritech has been the UIAS project manager. He has been in almost daily contact with Ameritech. In addition, several members of the UIAS management team have been in regular contact with the company. Ameritech has had many key people involved, including its president, its vice president for product development, and a number of other lead development personnel. In addition to regular phone calls, several meetings between the CSU project team and Ameritech personnel have occurred at three to six month intervals. They have been at either the CSU Chancellor's Office or Ameritech Library Systems headquarters in Provo, Utah.

As the project has progressed, it has become clear that this is a developmental partnership. Ameritech has worked hard to realize the complex objectives of UIAS in an open standards environment. Since the open standards for such functions as intercampus circulation and authentication are not yet finalized, this has proven a significant challenge. Ameritech has also had to port some components, notably its WebPAC product, from UNIX to NT so that the Pharos gateway could be on one server. The system requirements meant that their existing WebPAC and the under-development Resource Sharing System (RSS) had to be enhanced. In addition Ameritech had to develop a new module for Remote Patron Authentication (RPA). Specialized CSU task forces for database management, system design and implementation, user services and intercampus services have developed detailed requirements and reviewed developmental software and trial databases throughout the two-year period. Overall, it has been a unique opportunity for a vendor and a university to partner in development of a major new service for library users.

The Architecture of Pharos

Pharos is created by the interoperation of the following systems:

- twenty-two Pharos Gateway Servers -- one located at each of the twenty-two CSU libraries
- The Union Catalog/Z39.50 server -- located at the Chancellor's office
- 4CNET -- California State University's Wide Area Network
- The twenty-two CSU libraries' local integrated library system (ILS) Z39.50 servers
- Other California academic and public library Z39.50 servers
- The Internet
- Commercially operated Z39.50/HTTP servers providing access to indexing, abstracting, and full-text resources

The Pharos Gateway Server is comprised of:

- IBM IntelliStation
- MS NT 4.0 SP4
- Apache Server 1.3.2 (HTTP)
- Ameritech WebPAC 1.35 with bibengine 8.1 (Multi-threaded version 3, Z39.50 Client)
- Ameritech RSS (ISO 10161 Protocol Server)
- MS SQL Server 6.5
- Ameritech Remote Patron Authentication (RPA) Server

The Pharos Union Catalog is comprised of:

- IBM RS6000 -- S70
- AIX 4.3
- Sybase System 11
- Ameritech Horizon 5.x
- InfoSphere - ProIndex

Interoperation of Component Systems

Union Catalog

Because CSU libraries use integrated library systems from different vendors, the first step in developing Pharos was upgrading these local systems to include a Z39.50 V. 3 server. Building the union catalog was preceded by CSU's development of an algorithm that matches similar bibliographic records from the twenty-two library catalogs and then selects one of the matching records to be the *master record* retained in the union catalog. The program developed by Ameritech to implement this algorithm adds the local control number (LCN) to the master record from each of the matching CSU bibliographic records. The resulting MARC field in the Master Record is used to create a *Hook-to-Holdings,* which the Pharos Gateway Server resolves, using Z39.50, to dynamically retrieve the local call number and circulation status from each ILS. Holdings information is not stored in the Union Catalog. When fully operational, the union catalog will be updated on a daily basis with new, modified or deleted records from the twenty-two campus libraries.

The User's Perspective

To the user Pharos is a Web site, or part of a Web site, offered by the user's campus library. Pharos provides access to library information resources that can be obtained online, in the user's library, or requested from other libraries and/or document suppliers. The user is offered the opportunity to simultaneously search a number of catalogs and databases likely to contain the information desired by the user. Through the design of the screens generating the Pharos user interface, a novice user can begin with a general *Quick Search* that is intended to provide results that would lead the user to more specific information. Experienced users of the system can navigate quickly to topical screens that provide Quick Searches in subject domains. Expert users have access to more sophisticated searching options in specific databases or *native* interfaces offered by information providers that allow for more precise searching.

Authentication/Authorization

Integral to Pharos is an authentication/authorization system that provides a mechanism for controlling user access to impacted resources and services.

When using licensed resources or requesting materials not owned by the local library, the remote user is prompted to provide an I.D. number and last name by the Remote Patron Authentication (RPA) Server. The RPA submits this information to the library's ILS which then validates this user against its patron database. Assuming the user entered the correct information, the user is authorized to use licensed resources from the library or anywhere else on the Internet.

Intercampus Circulation/Interlibrary Loan/Document Delivery

If a user has searched for information in Pharos and located a record or citation for an item that is not locally/currently available, he or she is prompted to request the item. The user generates a request for this item and is prompted by the RPA to enter his or her user I.D. and last name. Assuming the user entered the correct information, he or she is authorized to submit a request. The request will contain information about the user provided by RPA from the patron database, and bibliographic information provided by the database in which the user located the desired item.

Ameritech's Resource Sharing System (RSS) Web service submits the request to the MS SQL server database. Based on profiling decisions made by the local library, requests can be automatically routed to: 1) a short list of CSU libraries owning this item; 2) other libraries, which the requesting library may have reciprocal borrowing agreements; 3) a document supply service contracted by CSU; and 4) national and international interlibrary loan services.

Users are able to check the status of their requests on the Pharos Website; doing so requires authentication by the RPA. The user is notified by an e-mail message when requested items are available. If the library chooses, the requested item can be delivered directly to the user.

Library Customization

Because each CSU library has its own gateway server, Pharos can be customized for each library in a number of ways. The library can select what combination of catalogs and commercial databases to offer in a broadcast search and can decide how to integrate Pharos with existing library Web pages. The library can add a campus logo and other campus information sources and can create predefined searches and full-text hypertext links for faculty syllabi Web pages, and Web-based full-text course reserves.

The Pharos demonstration server can be reached through the project home page at http://uias.calstate.edu.

The Future of Pharos

Pharos is by design intended to be an expanding and evolving resource; as the educational, technological and information environments change, so will Pharos. The most significant area of refinement of Pharos planned for the immediate future is its customization for the user.

Pharos incorporates an important advance in library systems technology by linking the user interface to the patron database stored in each library's computer system. In addition to enabling authorization and authentication for resource sharing and access to licensed databases, this linkage permits the customization of Pharos to correspond to a variety of demographic characteristics of the user. The sequence of screens, branching options, help and guidance resources and search tools can be designed to accommodate the needs of faculty versus students, graduates versus undergraduates, residential versus distance learning students, and fine arts versus biology majors. Help screens, information competence tutorials, and pre-selected combinations of information resources can be packaged for lower division students, for example, while faculty can be presented with screens designed for more advanced searching. It is even possible to customize the Pharos interface to the level of the individual by creating and storing a user's own Pharos Web page that contains profile and search history information.

As the CSU continues to refine and expand Pharos, it will build on two related ongoing system-wide initiatives: the Academic Information Services Cooperative (AISC) and the Information Competence Project. The AISC provides the core content for Pharos. It combines the collective purchasing power of twenty-two libraries to acquire a core collection of electronic bibliographic and full text resources available across the system. It also encompasses a system-wide program of document delivery (books and articles) and agreements for expedited borrowing from University of California libraries. A new and innovative project within this initiative is the Journal Access Core Collection[4] consisting of a customized electronic full-text database of selected journal titles most often subscribed to by CSU libraries.

The Information Competence Project[5] addresses the problem of making sense of the increasingly complex information environment; it is a critical element in the success of Pharos. Twenty multi-campus projects have been completed or are presently underway and include both general education and major-specific instructional programs. Several are in the form of Web-based modules that will be incorporated into Pharos. An information competence fellowship program and faculty workshops have also been developed.

Conclusion

The scope and complexity of the UIAS project has entailed a daunting array of challenges, both in its conception and execution as Pharos. Through close collaboration with Ameritech Library Services, we have succeeded in creating a service to our students and faculty that has enormous potential for delivery of information and educational resources tailored the needs of the individual. Pharos in its present manifestation as a gateway to knowledge is far from perfect or complete, but it offers a framework we can build upon and adapt to the information and educational environments of the 21st Century.

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Abstract

Category: Papers Presented at EDUCAUSE annual conferences

ID Number:	EDU9925
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Author:	Sandra K. Millard
Organization:	University of Delaware
Year:	1999
Abstract:	UDLib/SEARCH is a unique partnership between the University of Delaware Library and state K-12 education in Delaware. UDLib/SEARCH provides access to 16 full text databases via the Internet on the state network to all Delaware public high schools and middle schools, and training for teachers and librarians. Using $30 million in state funds, Delaware is the first state to wire every classroom in all public schools to the Internet, and UDLib/SEARCH is one of the first statewide applications on that network. This collaboration has served to further strengthen the partnership between the University, the state, and the education community.

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University of Delaware Library/Statewide K-12 Partnership Providing Online Resources and Training: UDLib/SEARCH

EDUCAUSE '99
Long Beach, California, Track 4, Friday, October 29, 1999, 8:15AM- 9:00AM, Rm 201, Convention Center
(Web Proceedings submitted in HTML format)

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UDLib/SEARCH is a unique partnership between the University of Delaware Library and state K-12 education in Delaware. UDLib/SEARCH provides access to 16 full text databases via the Internet on the state network to all Delaware public high schools and middle schools, and training for teachers and librarians. Using $30 million in state funds, Delaware is the first state to wire every classroom in all public schools to the Internet, and UDLib/SEARCH is one of the first statewide applications on that network. This collaboration has served to further strengthen the partnership between the University, the state, and the education community.

Introduction

UDLib/SEARCH is a University/K-12 statewide partnership in the state of Delaware between the University of Delaware and state K-12 education. It is a partnership program in which the University of Delaware Library provides access to 16 online full text web-based periodical databases and related database training for educators in all Delaware public high schools and middle schools with state funds. The current funding level from the state for FY2000 is $487,500 covering 61 schools. Funds have been requested from the state to expand to include all 97 public elementary schools for FY2001.

Background and Environment

All public K-12 schools in Delaware were wired to allow access to the Internet via one state network at state expense of $30 million over a three-year period completed in 1999. Schools and districts were responsible for purchasing equipment, providing staff to support the computers, implementing school based programs using the network, and training teachers in basic Internet use. Some state funds supported these activities, however most were largely the responsibility of school districts and local schools. Without this network, UDLib/SEARCH could never have existed.

Delaware is a small state with less than 700,000 citizens. There are 30 public high schools, 31 public middle schools, and 97 public elementary schools in the state of Delaware. Public schools received about 65.9% of their support from state funds in Fiscal Year 1997. In FY 1999, the Public Education budget—funding for K-12 education via the Department of Education--was $637,513,900.

The University of Delaware is a state-assisted Land Grant, Sea Grant, Space Grant, Urban Grant, Carnegie Research II University. It is the largest higher education institution in Delaware and the only large research university. For fiscal year 1998, total operating revenues were $409.2 million, including $85.0 million (approximately 21%) from state appropriations. Delaware draws the largest percentage of its students, 37%, from the state of Delaware. Fall 1998 enrollment totaled 21,346. The University of Delaware is expected to play a key role in provision of public service related to education in the state.

The University of Delaware Library includes the Hugh M. Morris Library, where the main collection is housed, three branch libraries located in Newark, the Agriculture Library, the Chemistry Library, and the Physics Library, and a fourth branch library, the Marine Studies Library in Lewes, Delaware. The collections of the University of Delaware Library parallel the University's academic interests and support all disciplines. The University of Delaware Library provides online electronic access via subscriptions to more than 150 Library Networked Databases via its library web site including: journal article references and abstracts; full text electronic articles; a full text encyclopedia; government information; electronic journals; maps and many other items. The Library Networked Databases contain hundreds of thousands of full text articles, references, and summaries of the contents of journals.

The University of Delaware Library is the largest library in the state of Delaware, and the only large research library. The Library serves the public by providing open walk-in access to all members of the public. Library services to K-12 schools include free loan of books and provision of photocopies to school libraries, access to web-based subject web pages and non-subscription resources, provision of tours to school groups, and most recently, provision of databases and training via the UDLib/SEARCH program.

The Library's experience in negotiating license agreements and providing access for 150 networked databases was expertise it felt it could offer to the state in providing statewide access to databases for K-12 schools.

Development of UDLib/SEARCH

University of Delaware President David P. Roselle and Provost Melvyn D. Schiavelli, appointed an Education Partnership Task Force in March 1996 to determine the perceptions of education and policy leaders in the state about the University of Delaware's role in public education, and to make recommendations how to strengthen the University's role in partnership with the state in K-12 education.

The Education Partnership Task Force met individually with thirty education leaders in the state to discuss the University-public education relationship, the perceptions of education and policy leaders about the role of the University of Delaware in public education, and how this relationship can improve K-12 education in Delaware. The very first recommendation of the May 1997 Education Partnership Task Force report from the University of Delaware was to make a very visible *tangible* commitment to Pre-K-12 education in the state of Delaware.

The development of the UDLib/SEARCH program began with a desire on the part of the University of Delaware President David Roselle and Provost Melvyn Schiavelli to strengthen the partnership with the state by providing a new *tangible* statewide service to state K-12 education.

The University of Delaware Library developed the plan that ultimately became UDLib/SEARCH. The Library was aware of the needs of school libraries, and met with various constituents to gain information and develop a proposal. UDLib/SEARCH was designed to meet a clear need for information resources required by schools. The average number of current print periodical subscriptions in Delaware public middle schools averaged just over 30, and the average number of current print periodical subscriptions in public high school libraries in Delaware is 53. A 1998 survey in Delaware showed that an average of only $8.20 per pupil expended on middle school library collections in Delaware public schools and $12.50 per pupil expended on high school library collections in public schools. These expenditures do not include the investment by the state of Delaware later via the UDLib/SEARCH partnership. Through UDLib/SEARCH alone, expenditures by the state of Delaware for database and training average increased by $8,000 per school in FY99.

Once the UDLib/SEARCH program plan was developed, political and financial support was sought from the State Department of Education, Governor Thomas Carper, the General Assembly and Joint Finance Committee, school librarians and the state library association, the State Librarian, and the Office of Telecommunications. After more than a year of discussion and consensus building, state funding for UDLib/SEARCH was approved in the amount of $210,000 for year one as part of the State of Delaware Department of Education budget allocation in July 1997. This $210,000 was then passed through to the University of Delaware Library to operate this program. In July 1998, the state again approved funding as part of the State Department of Education K-12 Pass-through budget, and increased it to $452,000 to continue the program to high schools and to expand the program to all Delaware public middle schools. The success of the program was recently shown in the funding of year three in the amount of $487,500 to continue services and access. One important reason for its success is that UDLib/SEARCH provides a *tangible* service to public schools in the state. It makes effective use of a newly implemented statewide network, provides equity in access to needed research resources for students, and provides related online database training for teachers. It has also strengthened the relationship between the University and K-12 education in the state, and became a program the University could point to with pride.

Implementation of UDLib/SEARCH

Database selection, license negotiation, procurement, and technical access implementation

Through the UDLib/SEARCH program, the University of Delaware Library, with state funds, negotiates license agreements and purchases database subscriptions for all public Delaware high schools and middle schools. The databases selected are those recommended by an Advisory Board consisting of school librarians, UDLib/SEARCH staff, and a representative from the state Department of Education. The vendors providing the databases include Britannica, World Book, Gale (all the DISCovering and Exploring series plus *Expanded Academic ASAP* and *Student Edition*), SIRS/Mandarin, and EBSCO.

UDLib/SEARCH Databases for High Schools and Middle Schools

Encyclopedias
Britannica Online
World Book Online

Magazine and Journal Articles
DISCovering Authors
DISCovering Biography
DISCovering Multicultural America
DISCovering Science
DISCovering U.S. History
DISCovering World History
Expanded Academic ASAP
EXPLORING Poetry
EXPLORING Shakespeare

Middle Search Plus - EBSCO
Primary Search - EBSCO
SIRS Discoverer
SIRS Government Reporter
SIRS Renaissance
SIRS Researcher
Student Edition

Ongoing database technical support, communication, troubleshooting, and training

UDLib/SEARCH staff do all communication with vendors and state network staff to implement access to the service. The main point of contact in the schools is the school librarian. All schools in Delaware are connected to the state network. The program provides centralized statewide access via the Internet to what is now a collection of 16 full text periodical and encyclopedia databases.

The Library provides all Delaware public high schools and middle schools with individualized training, technical assistance, communication, troubleshooting, and workshops for all issues related to UDLib/SEARCH access. More than 2,000 teachers were trained during the first two years. The Library provides related training for all teachers and librarians in all public high schools and middle schools in the state of Delaware.

The staff most involved with the program are the Program Director who is also the University of Delaware Library Assistant Director for Public Services, and the two Training Coordinators--one for High Schools and one for Middle Schools. The University Assistant Director for Library Computing Systems also is the liaison with vendor technical staff and state network staff to troubleshoot access problems. All UDLib/SEARCH staff are librarians. A UDLib/SEARCH web site was created by the Training Coordinators to provide easy access to databases and a communication vehicle with users. One of the first immediate tangible results of this innovation was to increase the average number of periodicals accessible in every public school from an average of less than 50 in print to more than 1,000 in electronic full text form through access to online periodicals. One result was equity for each school when gained access to exactly the same set of online resources more than 55,000 students in 61 middle schools and high schools.

Measuring success of University/K-12 partnerships

Is UDLib/SEARCH a successful partnership? Education leaders in the state, school librarians, and teachers expressed their belief that it was. The education research literature identifies factors which contribute to success of University/ school collaborations. Did UDLib/SEARCH also share these elements of success? It was important to study, because the continued success of this program and others depend upon it.

Elements of successful university/school collaborations

Factors which contribute to the success of university/school collaborations show up repeatedly in the research literature of university/school collaborations. A review of that literature showed that the following are elements of most successful university/school collaborations:

1. Effective leadership and commitment from top administrators.
2. Clear focus, good planning, and mutual interests.
3. Action and activities focused on change.
4. Careful selection of sites and staff.
5. Effective interpersonal communication.

How did UDLib/SEARCH compare?

1. Effective leadership and commitment from top administrators

The commitment to university/state education partnership by top leaders at the University of Delaware and in the state was the impetus for the development of the UDLib/SEARCH partnership, and the continuation and growth of the partnership is dependent on the continued support and commitment of these same top leaders.

2. Clear focus, good planning, and mutual interests

An important aspect to UDLib/SEARCH program design and implementation was clearly defining the focus of the program plan and implementation. UDLib/SEARCH was based the idea was that all schools should have access to the same databases, and that the University library was an appropriate and experienced leader to implement this access and provide related training. Planning involved gaining consensus from all interested parties, and making sure that the program met both the needs of the schools and the needs of the University.

3. Action and activities focused on change

The literature of University/school collaboration emphasizes the importance of paying attention to *activities*, not goals, in initiating a collaboration. Researchers repeatedly emphasized the shared ownership of problems, and making sure that universities work *with* schools rather than *impose a solution* onto schools. It was key in the UDLib/SEARCH partnership to provide a service that the schools wanted and needed, and to do it in a way that made the online resources available in a simple and consistent manner.

4. Careful selection of sites and staff

Choosing sites and staff carefully is particularly important in successful technology partnerships. Researchers studying the common features of successful technology partnerships found that choosing people and sites carefully was identified as one of the most important components of success. In the UDLib/SEARCH partnership, the *site* selected in year one in 1997 was **all public high schools** in Delaware. This site was selected because all public high schools had newly installed network connections to the state computing network providing access to the Web, clusters of networked computers for students access, active school libraries with experience with databases in CD-ROM and other formats. The partnership offered new, larger state funded databases of full text online periodicals and encyclopedia. All databases were made available to *every* high school via the new Web connections.

5. Effective interpersonal communication

A partnership is in its essence, personal--whether between two large organizations, or between two individuals. One of the strongest elements of the UDLib/SEARCH program is the personal and individualized communication between the UDLib/SEARCH staff and the school librarians and teachers via phone, email, and in person. It is this personal service that the schools praise and appreciate.

Measuring how Delaware education and policy leaders defined successful University/state K-12 partnerships

Strong positive relationships between universities and the state are vital. The beliefs of education and policy leaders often set the tone for whether the organizations are seen as strong partners. The University of Delaware cares about its relationship with the state, particularly related to public education.

An important measure of success for this program was what education and policy leaders believed about it. One purpose was to strengthen the relationship between the University and state K-12 education leadership.

The Dean of the University of Delaware College of Human Resources, Education and Public Policy describes the relationship between the University of Delaware and state K-12 education in this way:

> *My sense is that we're in a new chapter in that history, but we're not fully there yet. We're turning the pages to that new chapter that is going to be written by a different kind of engagement of higher education in relationship to K through 12 if we're successful--one will be that it will be grounded in the preparation and support of teachers, but won't be defined and limited by that. I believe we are starting to do that in higher education now—to practice what we preach. I believe that we are trying to do that at the University of Delaware. My sense is that it took a lot of courage from the leadership of our University to actually do what some people talked about--that is to bring together programs that deal with the challenges facing children of families in schools and communities--and not just to talk, but to actually do it.*

The UDLib/SEARCH partnership directly involves education and policy leaders at the University of Delaware, the state of Delaware, and local districts and schools. To determine what leaders believed about partnership, thirteen Delaware education and policy leaders were individually interviewed to discuss their beliefs about partnerships in general, about successful interorganizational partnerships in Delaware, about successful university/K-12 partnerships, and their thoughts about the UDLib/SEARCH partnership. Three types of organizations were selected: University of Delaware, state of Delaware, and school/district administrators.

University of Delaware leaders include the University of Delaware President and Provost who asked for development of a new program to benefit Delaware schools, the Director of Libraries who was responsible for oversight of the program, the Dean of the College of Human Resources, Education and Public Policy who supported the program in communications with other leaders. State of Delaware leaders directly involved and interviewed included the State Secretary of Education, the State Director of Telecommunications in the State Office of Information Services, the State Librarian communicated support to others in the state as a major public library institution. School leaders interviewed included the Superintendent of the largest school district in Delaware, Principal of a southern Delaware high school, the several School Librarians who were also officers of state library organizations.

The questions asked of those interviewed centered on these major areas:
How do education and policy leaders in Delaware who are affected by the UDLib/SEARCH program define partnership? Are university/statewide K-12 education partnerships different in Delaware? Which examples of successful partnerships do they provide and why did they believe these were successful? What do these leaders believe are the most important elements of a successful university/state education partnership? Why are partnerships between the University of Delaware and statewide K-12 education successful? What do these leaders feel about the UDLib/SEARCH partnership? If they believe it was successful, why?

What did education and policy leaders in Delaware say about partnerships?

Use of the word *partnership* signifies a set of beliefs

Simply *using* the word "partner" has significance. What does the act of simply using the word partnership signify in university/K-12 partnerships? Using the term partnership can be the first step in signifying a new set of beliefs and intent by those using the term—in this case the University of Delaware speaking of their intent with regard to state K-12 education. The act of using of the term partnership could be interpreted as the first act of partnership.

Provost Melvyn Schiavelli of the University of Delaware describes the use of the term partnership this way: "More than anything, I think, just the signals that you send out and the words you use are important. You're inviting people, so partnership implies you're going to be cooperative as opposed to being uncooperative. We're just saying we wanted to be involved and it was in our interest to be involved."

Partnership can mean quite different things to those using the term, and several leaders identified times when two organizations defined partnership very differently.

The following elements were mentioned by Delaware education and policy leaders as characteristic of successful partnerships between organizations.

Each partner:
1. Gains something and has self interest.
2. Works together toward common goals.
3. Agrees to contribute so both partners gain.
4. Brings something to the table and wants something from the other.
5. Understands someone often has to take the lead in any partnership.
6. Needs to be on the same page--partnership is more about process.
7. Receives mutual benefit and accepts mutual risk.
8. Shows flexibility.
9. Accepts responsibility to work toward common goal.
10. Believes that whoever initiates the partnership has more to offer.
11. Willingness to accept and give friendly and constructive criticism.

Administrators seeking funding for programs need to understand, define and recognize partnership and apply the criteria to, in this case, a requirement for inter-agency collaboration. The top Education Advisor to the Delaware Governor explained further:

> *"You'll notice that most funding in education now calls for some kind of collaboration or partnership--either inter-agency, or between nonprofit and public schools, or between the private sector and the public sector."*

The Delaware Secretary of Education defined partnership as follows:

> *"It's like signing a collaborative agreement. I don't think you will convince me that a partnership represents equity. I think in any agreement among two organizations, someone has to lead. Traditionally in all partnerships that I've been in, someone--some part of a partnership, some organization--took the lead. In this case, I do believe it is the University."*

The State of Delaware Budget Director's response was direct and to the point when he was asked how he would define a successful university/education partnership:

> *"There are really probably no real secrets here or format to be found. You're probably looking more at process, and that if you can get everybody going on the same page, you're likely to have a success. But the secret is how you get them on the same page."*

Communication

The results of the interview showed that a common theme in the responses of leaders interviewed was that communication was the most important element of successful partnerships—communication among partners and about the partnership to stakeholders.

The State Budget Director talked about his perception of communication between the University and the state:

> *"Go back and look at the budgets. If you look at the last couple of years you'll see most of the new things they propose are in fact partnerships or supportive of public service kind of programs."*

UDLib/SEARCH is funded not in the University of Delaware's budget from the state, but in K-12 Pass Through funds in the State Department of Education's budget because the program is run collaboratively and all funds go to support UDLib/SEARCH, the State Budget Director described the importance of how effective communication and a crucial decision made by the University President and Provost made UDLib/SEARCH funding possible:

> *"It might not have happened if the University demanded to be 'it'. The choice of the University to be willing to say that was a major, major piece. If you would have said, 'Well I want the money in the University budget...we're going to run the whole thing. But it's the fact that the President and Provost don't care where the money is. They're happy to work jointly—a partnership. This was very very important to this thing moving forward. It wasn't the University trying to take something over. It made it a lot easier to sell—took away a major potential impediment. That's a very powerful thing."*

Partnerships are personal, and start with two people sitting down together

The recurring theme was that interorganizational partnerships begin with two individuals, one from each organization.

Absolute equity not always required

The Secretary of Education commented on the elements of successful partnerships:

> *"Partnerships don't necessarily need, in my mind, to be defined in terms of equity in details to be successful. But they have to establish a* ***comfort level****, and I think that's exactly what this project has done. There's a high degree of comfort, there's a high degree of interest in the project. So therefore it's successful. So I think the relationships--the comfort level and the trust--is probably much more important that saying you have fifty percent of the control of power in making decisions, because that isn't the issue. The decisions are probably best made where they are [in UDLib/SEARCH] at the University level at this point, in terms of what's going forward."*

Constituents are the focus of concern for policy leaders

The Governor's Education Advisor commented on the elements of successful partnerships from her perspective as a former legislator and current Education Policy Advisor to the Governor:

> *"What I found the legislature asking most is – 'Are people really using this? How many people are being positively affected by this?' And they [the legislature] are actually getting down to, on almost all programs, 'What's the cost per person affected?' So the more people or students, teachers, you have accessing a program or an initiative, and somehow benefitting from it, the lower the cost per use is, and right now, that's a high priority in the minds of legislators. If you have a very expensive initiative, but it really only benefits a small population, the cost is obviously going to be high and they're going to wonder if it's really worth the value."*

People are very important--the relationships are critical

Communication patterns and relationships among policy and education leaders are different in Delaware on a statewide basis than in other states because of the small size of the state. The Presient of the University of Delaware responded this way to the question of whether Delaware is different:

> *"I think so. It's different in a sense of being manageable size-wise. That matters less than the fact that the players know one another. If you're unhappy you can make it be known right away....*
> *Delaware's different -- Viva la difference!"*

> The State Budget Director commented that : *"The range of solutions is probably narrower, [in Delaware] because we don't have as many. [In Pennsylvania there are] six universities in*

> *Philly and three in Pittsburgh." The University of Delaware is the only large research university in Delaware. This fact both puts more pressure on the university to participate in partnerships and also provides it with more resources from the state in support of partnerships....In a big state, you may have a hell of a time just finding out whom to talk to, and what do they know about you? Why are you talking, and why should they listen to you? --as opposed to being in Delaware we're small enough, you know....In a small state when you, in fact, have a [program] and it works, it's easier to add to it...so the difference is the people know you, you made all these connections. People even know who you are so you don't have to start back. All that makes it easier. If you've done things well, then people say, 'Okay, we'll give them another responsibility.' It doesn't necessarily have to be 100% logical. As you move forward, and as* ***you succeed,*** *it compounds upon itself.*

Credibility among partners

The State Librarian of Delaware, also a successful initiator of partnerships in the state, commented on the importance of credibility:

> *"If you are credible, if you are doing good things and you are providing good services-- people want to build partnerships with you. That gets known very quickly. People's faces immediately tell you about the likelihood, or what their impression would be of that organization. Candidly I think that one of the great strengths of the University Library, is that it has such a good reputation...they have great credibility. They do what they say."*

The informal network can make things go rapidly and effective

University Director of Libraries Susan Brynteson commented on the informal network and its importance in a partnership:

> *"Well, it probably is somewhat different in that it's size means that the same person often can take on different roles and wear different hats in different arenas. It's not unusual in Delaware to meet someone at another function, where the person has a different role. Delaware has no secrets, it's much easier to work together, one has many more contacts. The informal network can make things go rapidly and effectively."*

The University Provost commented:

> *"Delaware is different, period... in the sense that you run into the same people all the time, and things get done," snapping his fingers, "like that--overnight....In Delaware the decision-makers see one another more often. It always struck me that in the first year I was here I met the Governor more times in one year than I had met the Governor of Virginia in twenty-five years."*

Lessons of size and transferability of lessons to other collaborations

The issues and lessons related to size of the state of Delaware do not mean that the success of the collaboration between the University of Delaware Library and state K-12 education cannot be transferred to other collaboration programs. The lessons learned can be transferred to collaborations in other states, and also for programs between Universities and large schools, school districts, or county systems. The principles and practices of good collaborations transfer well.

Delaware Education and Policy Leaders' Perceptions of

UDLib/SEARCH

University Leaders' Perceptions

Comments included:

> *"I think it's terrific. It's got one of the fundamental elements of partnership—sharing what you have, what you know, what you can do with others. That's what the University has been doing more and more of. It's always done a lot of it, and it's doing more."*
>
> *"I think it's great... We heard about it from the Governor—he said good things! I think the most important thing was that we weren't overtly looking for something for ourselves. We were willing to share our expertise and energy"*
>
> *"Good! The Governor is happy with it I know."*

State Leaders' Perceptions

> *State Librarian: "Well I certainly do think it's successful! . I have no doubt based on the politics and the technology and the expertise—that the University Library is the only agency in the state that could have delivered this project. I do think it is extremely successful and I really commend the University and the University Library for stepping into what could have easily been [a problem]. But I think there was an opportunity here, and the University was willing to step up and deliver it. I think it's very successful. The difference is that* ***you're delivering a product and service-- not just an academic exercise.*** *The computer is or is not connecting to that service. In some ways I think that's new for schools and libraries—to be delivering those kinds of extremely measurable, on-time, on-task outcomes."*
>
> *Governor's Education Policy Advisor: "I can say, that when I do hear about it [UDLib/SEARCH], I hear about it in glowing terms....When a school uses UDLib/SEARCH, on Parents' Night...brings the parents in, and actually shows the parents what the kids can do to access this information—that's a very effective communication tool. The same with teachers."*

School and district leaders' perceptions of UDLib/SEARCH

> *"Sure. I mean it's, it's basically a free service, which the school systems can always use. Then the school system has to make the decision about how well or how much it's going to take advantage of that."*

School library leaders commented:

> *"Oh, well I think it's been an absolutely fabulous tool," exclaimed one school librarian. "I can't say enough positive things about it--we do use it here quite a bit."*
>
> *Another school librarian had this to say: "The thing is, all of this centers around our curriculum. UDLib/SEARCH centers everything around what the kids have to do in school--their assignments. What we have to do though is continuously tell them. You still have some students who will come in and heard about it by word of mouth, even though they've been here since ninth grade--but then you get a lot of kids who come in who transfer in. Students come into the library and initially want to go out and search the Internet for some sort of biography. At that point we [in the library] say 'Well why do that? Why don't you just go to the [Gale DISCovering Biography] biography database we have on UDLib/SEARCH?' The student will answer: 'Well I'm new to the school, how do you do that?' So then we have to just go through it. But once we show them, then they seem to fall in line. But I think in looking*

> *at everything that's offered, and the mere fact that you [the University of Delaware UDLib/SEARCH administrators] all have* ***asked*** *us what we wanted, that that helps out a great deal."*

University leaders influenced by Governor, Cabinet and Governor's Staff

The Provost explained his perception about UDLib/SEARCH:

> *"If we had put it up and the teachers were either, (a) left to flounder or (b) thought it was useless [the response would have been negative]. The people who are in a position to cause things to happen don't have the time to worry about the details of the implementation. So their view of a cooperative venture is determined you know, probably exclusively, on the positive side, by people coming up to them and saying, 'Boy this is* ***really*** *good.' They have no idea what 'really good' means. They have no idea whether that person is a judge of 'really good.' But you get five 'really goods' 'attaboys' or 'attagirls' then the chances are the next time that person says I think we want to do this...you'll say well they did a good job the last time. It's back to that people relationships.*

Anything related to classroom instruction—ask teachers, parents, students

> *"In anything that is directly related to classroom instruction, I think it is the teachers who can really tell us,"* explained the Education Policy Advisor to the Governor said. *"Secondarily, I would say parents. I mentioned to you that I have a middle school student. Although he's just begun middle school, and a junior in high school. Regarding UDLib/SEARCH-- I would want to go home and also ask them."*

Principals listen to many voices to make decisions in a site-based managed world

"Whose opinion would I take [related to a partnership like UDLib/SEARCH]? Oh my!" laughed a school principal He continued: "My opinion this year might be different than it might be last year, even more different next year. My daughter's opinion would be very important. She's a ninth grader this year. If she wanted to do research, this would be something that I would ask her." He then described how he evaluates programs as Principal and earlier, as Assistant Principal, using as a model how he might evaluate a teacher:

> *"As an Assistant Principal, sitting in the classroom evaluating the teacher, I would project out three children. I would project each one of them trying to learn in a particular setting. One is an advanced learner, one is a slow learner, one is in the middle. I try to project that, and then as far as whether or not they could use something like that [like UDLib/SEARCH databases] I'd probably let them play with it. I have umpteen people that are willing to give me advice, and some I take in particular areas more so than others. So it would just be more my feeling than anything else. I would also probably ask if it's [UDLib/SEARCH databases] being used. I would ask my Department Chairs, Are people in your department making good use of this, and I would ask why or why not. Is there a problem with it, is their department just not familiar with it. The term papers and research are pretty heavy duty by the time you hit twelfth grade. Those twelfth graders are pretty hammered with it. But I think that more than anything else it would probably be student reaction that would sway me."*

Conclusion

The UDLib/SEARCH program, now in it's third year of operation, has proven to be a successful model of a University/statewide K-12 collaboration to provide a well-defined technology based service. The reasons for it's success are that it provided a direct, tangible service to the state of a product selected by those involved, the recipients of the program used the services and products and communicated their positive feelings to others. The positive reactions were heard by education leaders and policy makers, who believed in response that the program was successful. It met its initial goal of strengthening the relationship between the University and the state education and is a model for future programs. UDLib/SEARCH offers a model for University/statewide K-12 education collaboration that can be scaled for large and small interorganizational collaboration by applying the lessons learned.

EDUCAUSE *Information Resources Library*

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Abstract

Category: Papers Presented at EDUCAUSE annual conferences

ID Number: EDU9931

Title: User Empowered Process for Information Technology Planning and Implementation

Author: Joe Grimes, Paul Zingg

Organization: California Polytechnic State University

Year: 1999

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User Empowered Process for Information Technology Planning and Implementation

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Abstract

The teaching/learning process must drive technology planning. Over the past several years an effort at Cal Poly has been under way to ensure that the culture of participatory and strategic governance promotes this principle, with both the users and the providers being of the same understanding and participating as part of the same team. The key to a successful effort is informed, engaged, and supportive institutional leadership. This presentation will show how this process has evolved, describing a process of continually advancing a user-defined strategic goals document with general categories of Access, Integration, Skills, Simplicity, and Process.

Title: User Empowered Process for Information Technology Planning and Implementation

Introduction

The responsibility of meeting the instructional information technology requirements of a university is much like the responsibility of exploring a new frontier. It is exciting; there are unknowns; there are hazards, and success brings an adrenaline surge to advance the frontier even further. In this paper, we address the components that we believe must be present in order to fulfill campus requirements for information technology in the teaching/learning process. We also will address the roles and responsibilities of each of the leaders in achieving real success in such a critical effort: the chief academic liaison, the chief information officer, and chief academic officer. We will look at where we began, where we are today, and the vision for the future. What will be said may seem obvious, but it is our belief that some insights can be gained from understanding how such efforts will succeed when aligned and interrelated through the specific use of defined processes and explicit committee structures.

Cal Poly is a comprehensive residential university with 15,000 full time equivalent students with Colleges of Agriculture, Architecture and Environmental Design, Business, Engineering, Liberal Arts, and Science and Mathematics. The campus has several related and pivotal campus committees which are concerned with the uses of IT and the resources that support them: Instructional Advisory Committee on Computing (IACC), Administrative Advisory Committee on Computing, and Information Resource Management Policy and Planning Committee, which provide recommendations regarding technology planning, policy, and implementation of the information technology requirements of the campus. The University has an "Instructional Computing Strategic Goals" (URL: http://www.multimedia.calpoly.edu/iacc/goals.html) document and an "Administrative Computing Strategic Goals" document which are used as a basis for planning and determining projects to be started. Both are revised periodically, and are designed to be both strategic and operational in their development and uses. The campus is significantly influenced by and also influences what happens at the California State University system level because of its current and historical leadership role within the CSU.

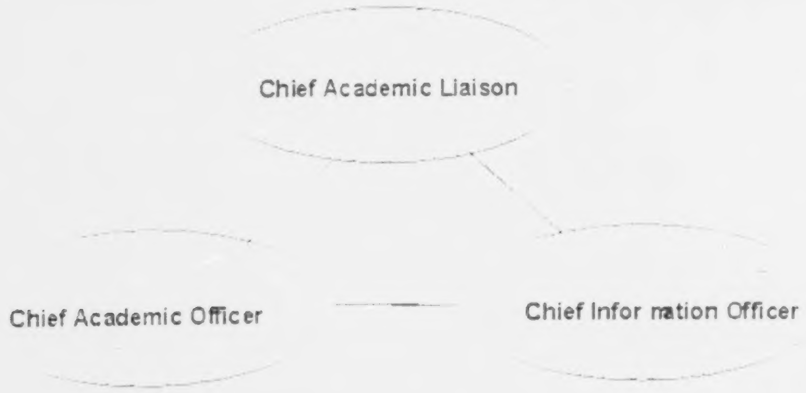
Requirements for a Successful Information Technology Process

The components of an environment that encourages participatory and strategic governance include a culture of trust and communication, and widespread agreement with the principle that teaching and learning processes must drive technology planning. At Cal Poly this kind of environment has been evolving as role clarity, mutually developed requirements, and increasingly explicit shared processes for governance and discourse have been refined. This balance is best described through the metaphor of a three legged stool, (see Figures 1 & 2,) which reflects what Cal Poly has developed a "system" which has several essential characteristics present and supported by the Chief Academic Liaison (CAL), the Chief Information Officer (CIO), and Chief Academic Officer (CAO).

Principle One: Trust, cooperation, and open communication must exist and be clearly demonstrated

The goal of these three individuals must be to provide leadership in the process of defining and meeting campus-wide academic information technology requirements. The leaders must be informed, engaged, and supportive and share a common vision and commitment to assign resources and their personal attention to what the process develops and recommends. It is essential that the leaders integrate planning and implementation in the technology area with those that are occurring in all other areas of discourse relating to the teaching/learning process of the University.

Figure 1 The Three Legged Stool of Trust, Cooperation, and Communication



Principle Two: Appropriate financial support must exist

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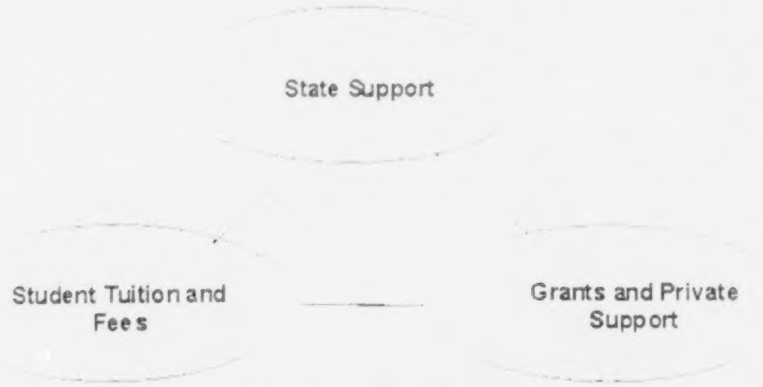
A second key factor for a successful process for providing information technology resources is appropriate financial support. This will be realized if the three legged stool (Figure 2) of state support, student fees and tuition, and grants and private support is balanced and delivers the critical mass of financial support and resources to advance the agreed to agenda. At Cal Poly we are investing considerable effort to insure that the annual budget is "the arithmetic expression of the plan" and that, as such, it is clearly derived from the initiatives which have been agreed to and which are core to the goals and strategies developed within the committee process. Accordingly, the budget must be open, available, and thoroughly understood by the Chief Academic Liaison, the Chief Information Officer, and Chief Academic Officer.

Figure 2 The Three Legged Stool of Financial Support



Best Practices can flourish in this well supported environment:

Investing in these two critical principles of "infrastructure" creates the culture and context to make real impact on developing and using the "best practices" that promote a wise use of IT in support of the core teaching and learning mission of the university. The practices address both the use of IT as it directly enables faculty to innovate in the classroom and other learning situations, but also in how to make the communications and support processes that foster change work as well. Our experience with some selected best practices include:"

- Using technology to implement the AAHE Principles for Good Practice in Undergraduate Education (URL:http://www.aahe.org/technology/ehrmann.htm) as they apply to Cal Poly.
- Access throughout the campus to key campus resources such as budgets, IT implementation plans for the campus, and other visionary plans for the campus.
- Explicit support for Innovative and empowered faculty and staff.
- Multidisciplinary initiatives.
- A process or processes for deciding and carrying forth initiative, inclusive of funding. See guidelines in the Exhibit, which should be revised to strengthen the funding element. The initiatives require a closure of operational and budgetary elements aligned with resources.
- Culture of communication and loop closure. A yearly cycle of seeking guidance, acting on the advice received, and reporting back on the actions taken.
- Understanding of the History of Information Technology on Campus.
- Understanding the nature of the University.
- Capitalization on the strengths of the campus.
- Assuming planning and implementation are never ending.
- Establishing financial responsibility.

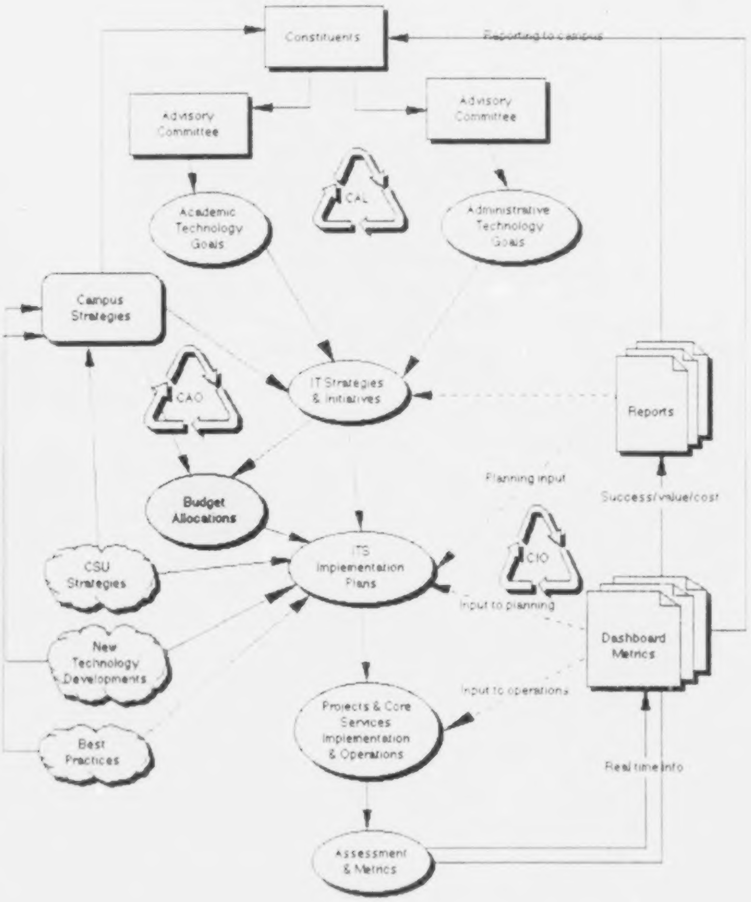
The Next Step is to create a closed loop system, informed by a well designed assessment process:

The process described in this section is illustrated in Figure 3. The diagram depicts the flow of information through the campus environment related to information technology planning. Constituents (faculty, students, and administrative offices) communicate with committees who represent their interests and act in an advisory role to Information Technology Services (ITS) and the CIO. The Campus Academic Liaison has primary responsibility for insuring that constituents and their representatives are able to voice their concerns and opinions. The CAL helps make explicit constituent concerns and needs in the annual review of academic technology goals. These goals are directly and explicitly incorporated into the development of ITS strategies and initiatives. This process is further illustrated in the case studies that follow.

The Chief Academic Officer insures that information from the external environment and other campus strategies related to the teaching and learning processes in particular, are included in the development of IT strategies and initiatives. Budget allocations are dependent in part on the degree of alignment between IT Strategies and Initiatives and the overall campus and CSU strategies.

The CIO seeks to define specific implementation plans and processes that give life to strategies and initiatives. Such implementation plans must seek a basis in the real life results of previous efforts, as reported via real-time "dashboard"metrics and more complicated, analytical assessments, as well as new technologies and discovery of best practices. The assessment and metrics elements of this information flow also provide valuable data for "tuning" operations and implementations as they are in process.

Figure 3 Campus Process


Constituents
Reporting to campus
Advisory Committee
Advisory Committee
CAL
Academic Technology Goals
Administrative Technology Goals
Campus Strategies
CAO
IT Strategies & Initiatives
Reports
Planning input
Success/value/cost
Budget Allocations
ITS Implementation Plans
CIO
CSU Strategies
Input to planning
Dashboard Metrics
New Technology Developments
Input to operations
Projects & Core Services Implementation & Operations
Best Practices
Real time info
Assessment & Metrics

Responsibilities of Chief Academic Liaison

The CAL has a role which is delightfully challenging, interesting, and essential to the success of technology planning and implementation for the campus. The key characteristics of the CAL are: integrity; the ability to engage the faculty, Deans, and other campus constituents to determine the campus requirements; knowledge of the learning process and the potential for technology to be applied to it; vision for the entire University; and a good understanding of the current availability of technology and its anticipated future paths. Most of all, the CAL must be keenly aware that: usually there are no simple solutions; that a prescriptive set of rules which will assure success to determine the correct solution and implementation path for the campus doesn't exist, and if one did exist, it would be in a constant state of flux; and finally, the best campus solution will not completely satisfy the requirements of anyone. The CAL must realize that success is a state of mind, not a place in time and that, as such, the process of setting and meeting intermediate step-wise results against broader goals is the key to achievement and progress.

The CAL must realize that the requirements for a successful information technology process will never be completely satisfied. Vigilance must be maintained in order to recognize what success means, and in order to continue moving toward that ever-changing definition of success.

Responsibilities of Chief Academic Officer

The CAO, the Provost on our campus, must act to insure that Information Technology is fully integrated into the strategic plan of the University and that the resources committed are focused and remain focused to serve means to other ends; specifically, the teaching and learning mission of the University. The concept of collegiality must be reinforced within the classic governance councils of the academy, especially for faculty, e.g. through wise Senate liaison, and with students, such that the "means to other more critical ends" is always in focus. The focus of such efforts must be to insure that accountability to teaching and learning, or service in support of teaching and learning, provides the basis of requirements and priorities that are then clearly articulated and regularly reported and communicated throughout the annual academic cycle.

Disciplines that tend to be strong(er) or more widely used in the world of IT, such as productivity analysis and measurement, and business case analysis of real costs and service or value delivery must be shared within the colleges, and the uses of such tools and processes encouraged and extended where sensible and practical to the core efforts of the Deans and Heads, Chairs, etc. for IT related, as well as other processes that serve the mission.

The CAO must be interested in how the incentives, recognition, and rewards systems that exist within the academy are made adaptable to the fundamental changes implicit in the increase of the uses of technology in support of sound and flexible pedagogies and the development of new/different forms of teaching achievement. A key point of emphasis is in fostering clarity as to what role faculty achievement in "mediated" or IT enhanced instruction, research, etc. should play in the RTP (retention, tenure, and promotion) process.

Finally, the CAO must be a concerned leader and change manager, who both through personal attention to the selection of key personnel and the empowerment of key processes, committees, and colloquia, expresses a personal commitment to guide how the institution addresses and benefits from the complex changes that IT fosters and occasions within our academic world.

Responsibilities of Chief Information Officer

The CIO responsibilities include defining the information technology vision for the campus, providing the leadership to insure successful implementations, and engaging the campus community in the planning, prioritization, and assessment phases of initiatives and projects. The CIO must help the campus develop, and then, promote a vision for the role of information technologies in supporting the core functions of the University, including the direct use of IT in instruction, the sustenance and improvement of the processes underlying program support, and the development of a community of scholars.

The CIO must also provide leadership in how the campus understands the impact and leverage of IT innovations that are well suited to the core mission of the institution and in exposing the true costs and benefits of integrating information technologies towards the achievement of this core mission. One principal theme we seek to achieve results with is to deliver two forms of services; one that is core or "utility based" and driven by operational excellence at the infrastructure level, and one that is "client or user specific" and tied to the delivery needs or outcomes of specific campus constituents; e.g. access needs of faculty, IT-lab requirements of students. Here the goals and intent of our users, and the consultative committees play a significant role and present real opportunities for alignment. We refer to our goal to achieving progress with these two forms of service as creating "more chickens and more eggs" since there is a continuous interplay and need to strike a balance between what and how we extend core services and yet truly build responsiveness to individual and specific initiatives..

Change management is another critical element in the successful CIO's portfolio of responsibilities, both as an agent of change from within the IT profession, and as one of several campus leaders who must articulate how change is to occur, how it is to be funded, if/where resources are a key to the change, and what are the essentials that need to be supported at the professional and personal level from within all the constituent stakeholder groups (faculty, students, and staff). This is and will be a truly "engaging and empowering role" that is most demanding as progress is made and obstacles to progress intervene.

This position is responsible for insuring that full and open discussions take place in order to establish a common understanding of goals, and to enable open prioritization of implementation plans. The CIO must drive discussions at the campus management level, at the advisory committee level, and within the ITS organization to set priorities and reasonable expectations of progress and outcomes.

Finally, the CIO must insure that the ITS organization is agile, knowledgeable, well-trained, and able to work as a team to plan, implement, and support projects and services with a culture that is "customer responsive, on-time, on-spec, and on budget".

Case Studies

Case Study #I: Process for a Faculty Workstation Program (FWP)

The faculty workstation program has become a popular and highly respected program at Cal Poly. It includes a balance: recognizing that the instructional application should drive the solution; being financially responsible; meeting requirements of the faculty; being efficient to implement; providing incentive for best application of the equipment; the mechanism for determination of requirements; implementation does not create overhead for the faculty; and that guidelines used not become constraints to doing what is right. It has been essential that the leaders of Figure 1 understand and subscribe to these principles.

Prior to the 1996-1997 academic year, the University provided the network infrastructure for the campus, but each department provided desktop computers for its faculty. The IACC formed a consensus that faculty minimum workstation requirements were not being met and that the campus infrastructure support should be extended to include the faculty workstation. To launch the FWP, IACC proceeded to carry out the following activities (Documents are located at URL: http://www.multimedia.calpoly.edu/iacc/documents.html):

- Develop and perform a Faculty Workstation Plan Survey. This survey measured the specific workstation requirements of the faculty. It was determined that over half of the faculty had no workstation or had one that did not meet the minimum requirement.
- Develop a Faculty Workstation Plan. This plan consisted of two phases: Catch-up (year 1) and Sustenance of Currency (years following year 1.). The principles of this plan which were implemented contained provisions for hardware, software, support, and training. This plan and

subsequent revisions provided a balance between ideal platform and support requirements, such as common architecture, and simplicity of implementation, such as each college receiving one workstation for each full time equivalent faculty member.
- Sent a Faculty Workstation Memo to the President. This memo, with the faculty workstation plan attached, sought full support for the Faculty Workstation Program by the President. The request, contained in the memo, was approved by the President, and the first year of the program was the 1996-1997 academic year.

The initial plan was quite successful but has since has been enhanced in the following ways:

- Development of a FWP WWW site at URL: http://www.multimedia.calpoly.edu/iacc/resources.html
- Movement from a one-size-fits-all hardware solution to an application use based solution.
- Provision of individual support and training for faculty who wanted it, when they received a new workstation.
- Provision of additional software. A central software keyserver was implemented to provide less frequently used software for faculty as they need it.
- Recognition that the instructional staff needs to be compatible and current with the faculty. This has resulted in a consideration of how to best satisfy these staff workstation requirements. Departments were always allowed to purchase staff workstations under the FWP.
- It was extended to include library faculty, military science, and athletics.

Each year the campus attempts to enhance the program through a loop closing process in which information is collected, analyzed, and discussed, and the FWP modified as appropriate.

Case Study #II: Integrated Media Services (IMS)

As digital media became more prevalent and mainstream in the early 90's, the provision of media support services became fragmented as the traditional classroom support organization continued to focus on old technologies (overhead projectors, slide projectors, VCR's) while other organizations provided ill-defined, ad hoc support for early adopters of newer, digitally based technologies (computer-based presentations with data/video projectors, laptops, including projection of internet content). As the fragmented support evolved, several problems appeared:

- Ability to develop multimedia presentations was not accompanied by the infrastructure necessary to deliver them.
- Early adopters of digital media received more courseware development support than was justified by program and campus priorities.
- The perception developed that only faculty with grant funds could obtain courseware development support.
- There was insufficient classroom support for faculty using either old or new technology.

To address these and other related issues, the Provost appointed a Task Group to examine the role of Distributed and Distance Learning at Cal Poly. A subsequent Study Group evaluated the needs and opportunities for supporting the advancement of teaching and learning with particular attention being paid to the roles of information technology. Finally, the CIO and Provost convened a Charette to develop a strategy and design for distributed teaching and learning. These efforts produced recommendations that were included in the planning for the development of Integrated Media Services (see http://www.multimedia.calpoly.edu/ims/main.html) in 1997 to fulfill the recommendations regarding:

- Distance Learning and Videoconferencing.
- Media presentation.
- Leverage IT to provide interactivity, improve instruction and learning.
- Improve Access to anytime, from anywhere.
- Clear responsibilities and support levels.

The reorganization resulting in IMS was achieved by recombination of existing staff and units from within Information Technology Services (ITS):

- Audio-video Services.
- Videoconferencing Support.
- Faculty Multimedia Development Center.
- Webmaster.

IMS now consists of three groups:

- **Media Application Services**. This group provides: a media development laboratory for faculty and approved students to use in development of faculty projects; provides an RFP process for faculty proposals for development of projects; provides access to training and ongoing support for CourseInfo; a course management and delivery system for web-based courses; in conjunction with the library provides faculty orientation, encouragement, training, and development support; and in cooperation with Media Distribution Services develops distance education materials.
- **Media Distribution Services.** MDS designs and supports electronic classrooms that can deliver instructional materials designed, developed or supported by MAS; provides a refresh schedule for aging, obsolete, broken, and unused hardware; provides video support; and maintains and operates the synchronous distance learning technologies.
- **Web Services Group (WSG).** The WSG provides web site design, development, maintenance and hosting services for campus organizations and units (not individual web sites or course web sites). These services are offered on a cost-recovery basis so that units unable or uninterested in staffing or hosting their own web site may still have a presence on the web that is of a professional, production quality. The WSG maintains and coordinates the campus web site, coordinating with offices all over campus to keep content current and accurate.

The guiding principle of IMS is to provide integrated, end to end service and support, aiding faculty in developing instructional materials (e.g., overhead transparencies, 35mm slides, PowerPoint presentations, web-based courseware, CD-ROM based course materials, video clips) to delivery in the classroom, via the web or via simultaneous audio/video distance learning modes.

IMS is in its infancy and its major efforts in the future will be to find the resources necessary to carry out its responsibilities and make service available and equally to all faculty.

Roles CAL, CIO, and CAO in FWP and IMS

The CAL function has been very successful in working with the CAO and CIO to provide forums for discussion of issues and requirements. We have inaugurated the discipline of an annual review meeting with the ITS organization which offers the opportunity for faculty representatives to express their instructional support needs and requirements to ITS and for key IT staff to engage in real time mutual dialog on results, expectations and strategies in support of goals. In addition, weekly meetings offer ITS staff the opportunity to hear of new needs and requirements, as well as dashboard information on how current programs are being received and interpreted. In addition to weekly meetings with dashboard readouts from advisory group members, the CAL seeks wider responses by informal discussions, surveys, web site publications, and email. This continuous assessment and feedback enables mid-stream adjustments which encourage participation by more faculty in discussions. Some results of this process thus far observed include: an apparent reduction in the level of distrust between faculty and ITS staff and administration; a wider appreciation of the roles and responsibilities of faculty, staff and administrators; and increasing cooperation on new projects and an increased focus on incremental progress mutually set and arrived at, consistent with shared expectations of investments, requirements and outcomes.

The CAO and CIO functions have primary responsibility for setting direction and offering incentives and opportunities for experimenting, exploring and testing the ideas that might encourage the campus community to move in a general direction involving effective use of instructional technologies.

The main roles and responsibilities played by the CAL, CAO and CIO with respect to faculty development involve providing leadership and incentives, the necessary platforms and infrastructure, and requirements and validation.

Faculty will always need and demand discipline-specific hardware, software, technical support, and training opportunities, but it is not necessary or efficient to have redundant support and training systems where replication is high and consistency is low. A role of the CIO and the CAO is to find the right balance between centralized, one size fits all systems and discipline-specific support and training.

Conclusion

In the world of providing a technology solution, success is never simple and it certainly doesn't mean that the job is done. Success tends to promote greater expectations in the future. However, it is clear to many (most?) on our campus that the foundation of a stable, inclusive process for identifying, planning and implementing instructional technology initiatives is in place, and the rate at which progress occurs in the next 3-5 years will be faster, and the results more broadly embraced than ever imagined, provided the principles and processes described here are not subverted.

In regard to technology, our campus discussion must address how well we are doing with respect to technological (informational and instructional) sophistication and progress. In particular, Cal Poly, as an institution, will answer such questions as:

- How can information technology assist Cal Poly to gain/preserve what it most wants/needs in order to be true to its mission and identity?
- How can information technology help Cal Poly not lose what it most needs and wants?

How can information technology strengthen Cal Poly's core institutional characteristics, such as: polytechnic, "learn by doing," undergraduate focus, teaching emphasis, residential, competitive admission, statewide service area, etc.

Exhibit

California Polytechnic State University
San Luis Obispo, CA 93407

Guidelines for Initiatives

Determining which initiatives are appropriate for the campus, setting priorities for initiatives, and carrying initiatives from conception to completion of a project that would evolve from it.

I. Background

The purpose of the guidelines for initiatives is to provide a strategic approach for advancing an initiative from its conception through completion of a project that would evolve from it. The initiative process should be used as a mechanism for enhancing productivity, increasing communications, utilizing resources more effectively, and creating a consistent and equitable process for management review, priority setting, and scheduling. The "Guidelines for Initiatives" provides guidelines for turning campus goals into initiatives with follow-up projects. **In order to assure coordination among all campus efforts, the guidelines in this document should be used with all campus initiatives.** The guidelines have been developed with the intent that they will:

- Provide a common set of information from which the campus can evaluate and advise on initiatives that are presented to it for approval/advisement/priority setting.
- Provide a common platform for assessing how a particular initiative advances the campus mission and strategic plan.

- Assist the sponsor of the initiative in understanding the scope of planning and support required to bring an initiative from concept through implementation and on-going operational support.

- Foster communication, collaboration, and coordination on initiatives that can, in turn, add to the benefits and expected outcomes of any given initiative by providing opportunity for others to participate.

II. Planning

A preliminary planning phase should be executed prior to launching an initiative and should include:

- A needs analysis including user or stakeholder input, alternatives explored, and assessment of trade-off with other potential initiatives.
- An assessment of resource requirements for the initiative from beginning to end based on what's known relative to the most likely solution and for on-going annual operations; including quantification and suggested sources.
- Scope, duration, and specific initiative goals and objectives.
- An assessment of how this initiative integrates with existing teaching and learning or business practices and what re-engineering may be needed and necessary to attain the desired results.

III. Campus Integration/Affinity

Initiatives should be actions that move the campus toward the realization of its goals and strategic plans. Proposals should include:

- Description of how the university, college, program, or division benefits from the initiative (both tangible and intangible benefits) with an indication of how the initiative maps to goals and the strategic plan.
- Description of how the initiative integrates with related active and planned initiatives.

IV. Coordination and Participation

Initiatives should be coordinated with the university community and other planned or in-progress related initiatives on the campus. Coordination should include:

- Identification and impact assessment of related initiatives.
- Consideration of a collaborative effort for like initiatives or ones that significantly overlap in goals, scope, and needed resources.
- A strategy for providing the opportunity for all appropriate members of the university to participate in the initiative.
- Before an initiative becomes an active project, it should be approved by all organizations that it will impact.

V. Support Strategies

Each initiative should develop a set of strategies for achieving success including:

- Executive sponsorship and commitment at the highest possible level.
- Inter and intra-departmental commitment, advocates, and support.
- Financial and other resource commitments through university budgets, corporate sponsorships, grants, or generation of outside funding.

VI. Project Life Cycle

Each approved initiative will become a project which should include an iterative set of steps, based on the preliminary planning phase, which includes:

- Project team identification, assignment and responsibilities.
- Refining scope, goals, and objectives based on integrated user/stakeholder needs.
- Initiative specifications.
- Implementation plan, schedule, and budget.
- Coordination with overlapping and inter-dependent initiatives.
- Implementation and project tracking.
- Integration and institutionalization of the initiative results into the teaching, learning, or work environment.
- Assessment of the value of the initiative, continuing operational resource requirements, and opportunities for extending the benefits beyond the original scope.

VII. Reporting

Periodic reports of performance and progress on approved initiatives shall be provided by the project teams to the appropriate consultative body not less than once each year at or before the spring term. Progress reporting should include:

A. Milestones and benefits achieved within scope of the initiatives as adopted and sanctioned by the consultative body.
B. Changes anticipated to plan, scope, duration, or resources needed.

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Abstract

Category: Papers Presented at EDUCAUSE annual conferences

ID Number: EDU9914

Title: Using E-mail as an Official Means of Communication

Author: Marian Ritland, Sue Shelton Moore

Organization: University of Wisconsin-Eau Claire

Year: 1999

Abstract: Nearly 90% of all UWEC students and staff are regular users of e-mail. The University has taken advantage of this widespread use and replaced many paper distributions--payroll earnings statements, unofficial transcripts, degree audits, adviser grade reports, bills, etc. -- with distribution via e-mail. Internal reports that were formerly printed and distributed to departments via campus mail are now e-mailed as attachments. Instructors are notified via e-mail when a student withdraws from class, and advisers are notified when an advisee withdraws from the University, neither of which was practical until e-mail. This paper discusses the specifics of the system, how it is being accepted by staff and students, savings, and what precautions other organizations should take if they decide to pursue using e-mail for official communication.

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Using E-mail as an Official Means of Communication

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Nearly 90% of all UWEC students and staff are regular users of email. The University has taken advantage of this widespread use and replaced many paper distributions--payroll earnings statements, unofficial transcripts, degree audits, adviser grade reports, bills, etc. -- with distribution via email. Internal reports that were formerly printed and distributed to departments via campus mail are now emailed as attachments. Instructors are notified via email when a student withdraws from class, and advisers are notified when an advisee withdraws from the University, neither of which was practical until email. This paper discusses the specifics of the system, how it is being accepted by staff and students, savings, and what precautions other organizations should take if they decide to pursue using e-mail for official communication.

Introduction

At UW-Eau Claire email is a utility. We rely on it just as we rely on heat, water and electricity. Instructors use it to communicate with their students and advisees; administrators use it to communicate with faculty; employees use it to communicate with each other, and students use it to communicate with everyone. While UW-Eau Claire is not unique in the proliferation of email, we do believe that we have taken our use of it a step farther than most institutions. We have taken advantage of this widespread email utilization, and now use it to distribute administrative reports, personal documents and official notifications--saving money and improving service to students and faculty. We believe that we have been quite successful.

This paper will give an overview of UW-Eau Claire, our email services, distribution lists, and official use of email. We will discuss the savings and advantages of email as a delivery vehicle. We will also tell you how it has been accepted and share with you some precautions to take if you decide to use email as an official means of communication.

The University of Wisconsin – Eau Claire

UW-Eau Claire is a four year, public, liberal arts university. We have about 10,500 students (9800 undergraduate and 700 graduate students) during the regular academic year and about 3000 during the summer. We have about 1,200 faculty, academic staff, classified staff, and limited term employees.

Hardware / Software Environment

Until recently, UW-Eau Claire used Control Data's Mail*Hub for our primary email server. This is a Unix based system. This fall we switched over to Microsoft Exchange as our primary email server. We use a Unisys ClearPath NX mainframe for our administrative systems, almost all of which have been developed in-house. The mainframe uses a Unisys proprietary operating system called MCP/AS, which includes TCP/IP and contains a Windows NT server in the same box. Our desktop environment is primarily Windows NT. Our primary email client is Eudora, though many other email clients are also used. Our other servers (Web, DNS, Notes, Library, etc.) are primarily Windows NT or various flavors of Unix.

Email Services at UW-Eau Claire

Around 1985 we began providing email access to selected employees. The number of employees with email access increased significantly between 1985 and 1995. In 1995 we began providing email access to all employees and all students. This was the point at which we began to view email services as a utility that students and staff should never be without.

Email Accounts at UW-Eau Claire

As soon as an employee is added to our personnel database and receives a current or future appointment, he/she receives an email account. This is an overnight process. Students receive an email account after they are accepted and before they are scheduled to arrive on campus or when they first register--whichever happens first. This is also an overnight process.

Email use on campus is widespread. 90% of our students are active users of email; for undergraduates the figure is closer to 95%. 90% of our staff are also active users of email; most of the non-users are people who don't work at desks, such as custodians and maintenance workers, though we do have a few faculty who still refuse to use email.

We remove email accounts that have expired twice a year, around March and October. This allows students to retain access to their email accounts for several months after they graduate or stop attending UW-Eau Claire. Employees retain access to their email accounts until the March or October after they were last employed. Emeriti and other retirees, however, are allowed to retain their email accounts indefinitely.

We have taken many steps to encourage the use of email. We provide free training on how to use email to both students and staff. We provide staff members who do not have computers at their desks (or desks for that matter) access to computer kiosks for checking and sending email. More and more instructors are relying on email to communicate with their students. For many courses email use is required. And…the more email is used, the more people use email. The percentage of users of email has increased steadily. Use by students jumped quickly when they discovered that if they used email, they would get their registration appointments a few days or weeks earlier. (Electronic registration materials were distributed prior to paper ones.) We collect email addresses from prospective students and alumni though we don't provide them with email accounts. This allows us to keep in contact with alumni via email, which is much less expensive than paper mail.

It is this universal access to email by all staff and students which made email delivery of information possible and practical. Anyone who does not use email at UW-Eau Claire is CHOOSING not to use it!

Automated Class Distribution Lists

In 1995, when we first provided email accounts to all students, we also began creating class distribution lists that are directed to all the students enrolled in a class along with the instructor(s) of the class. Any staff members may use these class distribution lists. Students may also use the distribution list for the classes in which they are enrolled. This allows these distribution lists to be used as pseudo "news groups", facilitating class discussions.

A primary use of these distribution lists is in assisting instructors in building their gradebooks. We created a function called "gradebook" that allows a faculty member to request a list of the students in a class which can be subsequently pasted into a spreadsheet--saving the instructor from entering the students manually. To use this function a faculty member sends an email to "gradebook" and places the name of the class distribution list in the subject line of the email message. They get back a list of the members of the distribution list along with the email name, student ID and classification of each person in the list.

The names of the class distribution lists are in the format 9999.xxxx.999.xxx where 9999 indicates the term, xxxx indicates the course department, 999 indicates the course number, and xxx indicates the course section. The name of the distribution list for section 001 of English 110 offered in the fall of 1998 is 9891.engl.110.001. In 1998, we began allowing additional people to be added to a list at the request of the instructor. An example of these are upper class student mentors assigned to freshmen experience classes that are not instructors and not officially taking the course.

Class distribution lists are re-built nightly for any class that has had drop/add activity that day. At first we did not create distribution lists for a term until a few weeks before the start of the term. Now we create them as soon as registration begins. This means that as soon as students register for a class we can begin communicating with them as a class.

Standard Distribution Lists

Soon after our introduction of campus-wide email, we began receiving all kinds of requests to create distribution lists of one kind or another. The creation and maintenance of these lists were eating up the time of the technical people charged with administering our email system. We needed to come up with a way to reduce the number of these requests. We decided to increase the number and types of distribution lists that were created and maintained routinely. Below is a list of some of the standard lists we create along with examples and descriptions.

xxxx.majors* - *engl.majors - *undergraduate students with an English major*
xxxx.minors* - *engl.minors - *undergraduate students with an English minor*
xxxx.gradstu* - *engl.gradstu - *graduate students in English*
999999.program - *students with the specific major or minor identified by the code 999999*
xxxxxxxx.advisees - *ritlanmm.advisees - students advised by the person with the email name ritlanmm*
xxxx.staff* - *engl.staff - *English department members (includes the secretary)*
all.uwec.staff - *all staff members at UW-Eau Claire (usage restricted)*
contact.staff - *designated contact staff person in each department*
chancellors.staff - *self explanatory*
classified.staff - *all permanent support staff members*
lte.staff - *all limited term employees*
academic.chairs - *academic department chairs*
deans.list - *deans, associate deans, assistant deans*
supervisors.list - *all support staff supervisors*

Ad Hoc Distribution Lists

Creation of the standard distribution lists above was helpful in reducing the volume of requests, but there continued to be a significant number of requests for specialized lists. To deal with this problem we created tools and placed them in the hands of the Registrar and the Personnel office, allowing them to create distribution lists for themselves and for others. Historically, these offices have responded to requests for mailing labels and reports using existing ad hoc reporting tools. We saw providing the capability to create distribution lists as a natural extension of the label production service. This has gotten our technical people almost completely out of the job of creating distribution lists.

Emailing from the Administrative Mainframe

In 1996, we acquired from GoldEye Software two pieces of software that allowed us to send email from our administrative mainframe. One piece of software allows us to send email messages directly from COBOL (or other language) programs. The other piece of software allows us to distribute mainframe reports as email attachments directly from our administrative mainframe. We realized right away that this might be a way to divert documents from print to email distribution and save time and money in the process.

We decided to make advisor grade reports our first test of this capability. Prior to this, every semester we had produced a printed grade report for each student. These grade reports were distributed to academic departments and then to individual advisors. We changed the advisor grade report program to allow either print or email distribution. We then sent an email to advisors inviting them to subscribe to the email version of the advisor grade report. The invitation contained a sample grade report. About 150 faculty members subscribed. We recorded the preferences of the faculty members who requested email distribution on the database. The distribution was very successful. In some cases we needed to provide some training on the use of email filters to assist advisors in managing these emails. We also discovered that if an advisor was using a proportional font as their default email font, the grade report that was organized in columns did not display correctly. We added a warning at the beginning of the email advising them to chose "Courier New" as their font.

With the success of this project, we plunged ahead into replacing paper with email wherever practical. Since 1996 UW-Eau Claire has been emailing directly from our administrative mainframe many reports and documents that were formerly printed, separated by hand, addressed and stuffed into envelopes for distribution via campus mail services or stamped, sorted and mailed via the U.S. Postal Service. We've saved time, money, and paper; and are providing faster, more accurate, and more flexible document delivery to our staff and students.

We send notifications on- and off-campus telling users that a file has just been FTP'ed or that a file is now available to be picked up. We also notify users of the results of processing. We notify programmers about errors or problems needing attention. We send files as attachments or inserted in the body of the emails.

As more and more paychecks are deposited electronically; the challenge of distributing the earnings statements remains. UW-Eau Claire converted this too, to electronic distribution--we email most earnings statements directly to staff and student employees. Students request unofficial transcripts, degree audits and bills on-line. Faculty request unofficial transcripts and degree audits for their advisees on-line. These documents are delivered via email. We will soon begin sending out grade reports and bills with a return receipt. Our plan is to mail paper versions of these documents only to students for whom we have not processed a return receipt.

Once a term we send an email to students with the current address information we have on file. The email contains a URL that will link them to the Registrar's address update page on the web. We send students registrations appointment times via email along with a current degree audit. We notify advisors when any of their advisees withdraw from school. We notify instructors when one of their students withdraws from a class after the initial drop/add period has ended. We notify instructors when students will be absent from class for illness or approved absences like field trips.

The mainframe reports that we now distribute via email are too numerous to list here. They include all kinds of reports--very short reports, very long reports, daily reports, reports that are viewed and discarded without ever touching paper, reports that are permanently retained--simply all kinds of reports.

Emailing to the Administrative Mainframe

When UW-Eau Claire decided to make electronic grade submission available to faculty, we decided that email was the preferred delivery vehicle. So… now instead of having to physically hand in grades on paper; or enter grades into a database, faculty can simply send their grades via email addressed to a "gradesubmit" address, with a subject line indicating the term and course ID. The body of the email must also contain a special security code known only to the instructor. Email delivered to the "gradesubmit" address is collected regularly (every 20 minutes) by the mainframe, and a program was written which posts the grades to the appropriate enrollment files. Automated emails indicating receipt of the submission, and verifying the success/errors of the submission are then returned to the submitter. Faculty who maintain electronic gradebooks (spreadsheets) throughout the term can do a quick "copy & paste" and have their grades submitted in minutes! But, even faculty who do not maintain a spreadsheet can retrieve (via email) heir class lists, type in grades following each name, and submit them via email.

We have not made this grade submission method mandatory, but faculty who have used it invariably rave about its convenience.

Our latest email innovation has been a solution to the age-old problem of "posting" grades. The Registrar's Office has historically advised against grade-posting, but students have continually requested that faculty do so; and faculty have too often opted for unsecured means of posting. So, we have now developed an address called "exampost," to which faculty can send an email, listing the email names of all students in the class and the grades earned. This message will be sent to the mainframe where it is parsed into separate emails sent to each of the students, containing their grade only.

This not only meets the "posting" need for routine grading, but it gives us a vehicle for the electronic distribution of mid-term grades--something which was previously done manually (by faculty, for freshmen students only).

Student and Staff Acceptance

Students, as one would expect, have been very adaptable. They immediately saw the benefits of receiving documents via email. They can make on-line requests for emailed documents such as transcripts, degree audits, and bills--saving them a trip to an office to pick up a paper copy. Many had difficulty opening attachments, so--for the most part, we have sent them only emails with the information in the body of the message. Students have even been initiating some requests for email distribution. If any group of students was a bit reluctant, it was the graduate students who tend to be older and the least comfortable with email, at least on our campus.

Faculty have had mixed reactions. Some like it. Some don't. If they do not like it, they certainly let us know. We have encouraged them to set up filters to manage their email and have resisted making exceptions to standard email distributions. Some documents are only distributed via email. If they don't use email, they do not receive the document. For the most part, they've been pretty positive and appreciative. They too have on-line access to request transcripts and degree audits for their advisees, which are delivered via email. They like this very much.

Support staff were a bit unsure at first. Once they started using it and saw how easy it was-- how much it was like dealing with any other emails and attachments, they became comfortable. They started to see the advantages as they worked with it. The speed of delivery as compared to the delivery time for paper reports really sold them. They could start their work at 8:00am instead of waiting for paper reports which often didn't reach them until 9:00am or the next day. If they were comfortable using a PC, their acceptance level was high. Once they started getting some documents via email they started asking if they could receive additional reports this way. Usually the answer was "yes."

As you might expect, some of our programmers were the most difficult to sell on this. They had many legitimate concerns. As they experimented a bit with recoverable reports, their appreciation grew. They had to learn a bit about SMTP and POP, and how our email servers worked, but this also was a plus.

Advantages

There are lots of advantages, many of which have been touched on previously. One of the most significant is the speed and accuracy of delivery. People don't need to wait for the reports to be sorted either by the computer center or the mailroom. People don't need to wait for the mail to come. People don't need to wait for the office secretary to distribute the reports. None of this waiting is necessary, because the reports are emailed directly to the persons for whom they are ultimately intended, usually within minutes. Delivery is accurate; report distribution errors are reduced or eliminated.

One of the biggest benefits of receiving documents via email is all of the different things you can do with the emailed information once you get it. The power of the PC and its tools are available to use and manage the emailed reports as you wish. Reports are electronically searchable; instead of paging through long reports looking for a particular person or dollar amount, tools such as MS Word allow documents to be searched electronically. Reports may be printed all or in part. Reports are more "in-your-face" and are less easily misplaced or ignored. Reports may be moved to a shared directory to allow access by multiple people. Reports may be retained on a server. Reports may be burned to a CD. Reports may be forwarded to others for review. Multiple copies of a report can be viewed and scrolled at the same time on the same screen. Reports may be cut, copied and pasted into another document or spreadsheet.

Some reports that may not have been practical for paper distribution may now be. Notifications to instructors when a student withdraws from a class or from the University was not something that was previously practical at UW-Eau Claire, but it is practical and has been very much appreciated since we have begun sending notifications via email. Reports may also be sent to multiple people--even dozens or hundreds of people--something that might be neither affordable nor practical with a printed version.

Savings

Less paper. We have saved lots and lots of paper. At least a 30% reduction so far. We have also saved all the consumables that go with printing (e.g. toner, envelopes and labels). The costs of printing are also pushed out to the users. They can decide whether something is worth printing and they bear the costs of printing. We don't have to convince them they don't really need some huge report. We can say yes without paying for printing.

Less microfiche. Once each term (4 times a year) we close out our student account receivables. This closing process generated several thousand pages of reports that used to go to microfiche and paper. Microfiche for retention and paper because users couldn't be without the information while waiting for the microfiche to be generated. Now we email the reports to a staff member in that office who moves them to a shared directory. No microfiche OR paper reports are created anymore as part of this process. Everyone in the office now has access to the information which is now electronically searchable.

Less postage. We haven't spent a lot of time measuring this, but we have definitely saved postage. We will save even more as we begin to exploit return receipt functionality and eliminate more and more mandated mailings. Return receipt and automated processing of the return receipt messages will allow us to use email for notifications required by law. One example is the notifications we are required to send to students when we apply their financial aid to their account to pay their student fees. We send out thousands of these every year.

Fewer, smaller printers. Because much printing is now diverted from the computer room and the large mainframe printers, we can buy fewer and smaller printers. We went from two 75 page per minute printers to two 40 page per minute printers attached to our mainframe. We are also less dependent on them because more of our reports can be distributed in other ways. Distributed printers have replaced some of this printing, but much of it has been eliminated altogether.

Less operator time. Computing and Networking Services runs a lights-out computer room from 4:30pm until 6:00am. Not all of this is due to our diversion of printing to email, but we have reduced operator time as printing has decreased. We expect this to continue.

Fewer lost reports. We have lots of little reports that were easily lost and required lots of careful handling to be distributed properly. There have been significant savings here too.

Less distribution time. Payroll used to hire people to hand out paychecks and earnings statements. That burden is much reduced. The Registrar used to hire students to hand out printed degree audits for a full week each semester just before each registration period. That expense has been eliminated.

Improved Services

People have their reports when they get to work in the morning instead of waiting for our staff to sort and distribute them. Other reports that were distributed via campus mail used to take a day or more to reach the recipient. No longer.

After leaving our office, reports destined for various departments might also need to be sorted and distributed by the department secretary. Now these reports can be sent directly to the person for whom they are intended, bypassing the secretary and saving her time and more delay.

Reports that had some value but didn't justify the expense of printing can now be generated more often and more completely.

We can send students confirmations of schedule changes whenever one occurs, because we no longer have to pay postage. We can email it!

Precautions

Keep in mind the people who do not use email, either because they don't know how or because they don't want to. Retain alternative delivery for non-email users when feasible. Also use return receipt for documents that MUST be delivered. Know who is using email. We do this by reading the logs for people who are checking email and send a summary of this information back to our database for recording. This allows us to know before we send an email from our administrative mainframe whether someone is likely to read it. It helps us decide when and if we should send it another way. (This is also how I know that our email usage is at 90%.) Sometimes the people who don't use email will surprise you.

Bring your email administrators and your programmers together. They will need each other's help to make this work. Get them comfortable with asking each other for assistance. Inform them of what each can do for the other. Often these people have different backgrounds. It might require bringing your mainframe COBOL programmers together with the PC/NT people who use Perl as their primary language.

Learn how email works. Learn something about SMTP and POP3.

Handle errors. If your SMTP server is down, you must be able to recover and regenerate the messages. We have reduced this problem by creating a utility program that emails messages from a standard file format. Any programs that are not easily re-run build a file of email messages that is processed by the utility program. It has all necessary error-handling, marks each message after a successful send, and is capable of re-sending any or all messages if necessary.

Make sure your email server and the servers upon which people store their email are able to hold the size and number of messages and reports you are sending.

Let your help desk know what's going on BEFORE you do a big mailing. Involve the help desk staff in the piloting of new applications if at all possible. Try out different email clients and different fonts when reading the messages. What might look good in one font may look terrible in another.

Make sure undeliverable messages get sent to a real person. Don't let them vanish into cyberspace. Undeliverable messages can be a key to finding problems with your system and your assumptions earlier instead of later.

Use aliases and distribution lists for directing urgent messages to staff whenever possible so you don't need to re-direct messages whenever someone goes on vacation. Recognize that many recipients will "reply" to a mass mailing, even if directed not to, so set up an address that is appropriate to receive and handle those responses.

Teach recipients how to lock documents after they have received them using passwords or read-only directories to prevent changes, accidental or intentional, to documents meant for permanent retention.

Let your users warm up to it. Take it slowly. Don't force them. They'll see the benefits if you give them a bit of time.

Test! Test! Test! It's really easy to send thousands of messages to the wrong place if you're not careful. Some of this data is confidential; guard it carefully.

Conclusion

You can save money and improve services to your faculty and students by using email as an official means of communication. Don't wait to plug into email's full power!

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Abstract

Category: Papers Presented at EDUCAUSE annual conferences

ID Number: EDU9922

Title: Virtual Organizations, Virtual Mentoring, and At-Risk Youth: Implementation of a New Metacommunity

Author: Kevin C. Facemyer, Nils S. Peterson, John Emerson, Claire Van Wingerden, Tomikia Perkins

Organization: Digital Ekistics, Washington State University, The Casey Family Program

Year: 1999

Abstract: Forty high school students from various different areas in the western United States collaborated in a year-long project designed to prepare youth for successful school-to-life transitions. The predominant mechanisms of interaction were e-mail, synchronous chats, and shared threaded writing posted in a virtual space via the Internet. This session will present four perspectives on the curriculum and online interactions designed to prepare youth for successful school-to-life transitions. The presenters will discuss the role of advanced technology in relation to success, outreach, partnerships, and communities.

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Virtual Organizations, Virtual Mentoring, and At-Risk Youth: Implementation of a New Metacommunity.

Kevin C. Facemyer, & Nils S. Peterson,

with John Emerson, Claire Van Wingerden, and Tomikia Perkins.

Introduction

This paper, like the partnership it describes, has multiple perspectives, as evidenced by the following introductions, first in the eyes of the organizations and then in the eyes of the participants:

- Introduction One: The Casey Family Program and Washington State University's College of Education joined in a partnership to prepare youth in foster care to take their rightful place as contributing members of their communities by involving them in a yearlong online community composed of peers, mentors, and administrators.

  Introduction Two: Washington State University's College of Education and The Casey Family Program joined in a partnership to explore the use of online communities composed of peers, mentors, and administrators to foster learning, growth, and development of youth, expanding the children's understanding of being a contributing member of a community.

  Introduction Three: Students at Washington State University and youth in the foster care of The Casey Family Program joined in a online partnership of recreation, informal and formal advising and education to foster growth and development of youth in foster care, enabling the children to grow as they developed new relationships with older peers.

  Introduction Four: Youth in the foster care of The Casey Family Program and students of Washington State University joined in a online partnership of recreation, as well as informal and formal advising and education to foster growth and development. University students developed skills related to teaching, mentoring, counseling, online communications, and technical support as they matured into positions of service and education.

All four of these scenarios are true, valid and reasonable perspectives. Viewing this project from these various perspectives illuminates the fundamental features of good partnerships (mutual reciprocity) and hints at optimum outcomes (transformation of people and organizations).

Preview of Conclusion: Most of the interactions in this partnership were engineered for mutual reciprocity and transformation. When the interactions were unsatisfactory, we often found them out of alignment with respect to the goals of mutual reciprocity and transformation. In general, unsatisfactory interactions were the result of asymmetries between benefit and effort, lapses into transactional relationships or nonviable virtual organizational elements.

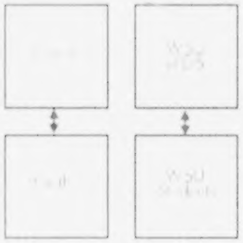
To reach this conclusion, we will explore this partnership and partnerships in general, by discussing:

1. the project

2. the lessons learned
3. the policy issues raised by such projects and
4. the best ways technology should be used in the future to
    - extend communities,
    - enrich collaboration, and
    - link together research, teaching, and public service.

The Project

We will describe the project in terms of its institutional interactions and then give a participant perspective on the project. This box metaphor will provide the scaffolding for vignettes and testimony by various authors of this paper.



This is a diagram of the project participants. The arrows represent traditional interactions defined by the organizational relationships to their constituents.

Casey has a long standing tradition of providing long term foster care to at-risk youth. WSU has a long term commitment to educating teachers and administrators. WSU has rarely interacted with service

In 1995 Tom Helm, then director of education for The Casey Family Program (Casey) watched the WSU Virtual Professional Development School (vPDS) host and conduct an online world wide science fair (Fair). The vPDS (Abdal-Haqq, 1995) and the Fair received national (Holden, 1995; Sommerfeld, 1995; & Wilson, 1995) as well as local (Cole, 1995; Johnson, 1995; & McDouough, 1995) attention. As an innovative online meeting, the Fair and its use of the Internet to form community was perceived as a positive experience by participants, teachers and parents. The interaction between K-12 children, university faculty, scientists, and university students was a proof-of-concept regarding the use of email, bulletin boards, and shared writing as the basis for establishing a viable community of people from various arenas dedicated to various aspects of helping children do science. The Casey Family Program noticed the applicability of establishing online communities to promote growth in their youth.

Over three years, between 1995 and 1998, each organization had shifts in leadership. For Casey, John Emerson followed Sylvia Pizzini, who followed Tom Helm; for WSU Dean Judy Mitchell succeded Walt Gmelch, who succeded Bernie Oliver. This observation suggests that the institutional mission of each organization was driving this partnership rather than some other personal dynamic between the participants.

WSU
WSU Students

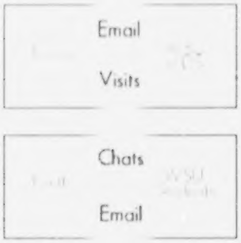
For several years negotiations between Casey and WSU took place to outline the interaction between a select group of WSU students to act as online mentors in a project called Casey Cougar Camp.

Youth and Mentors were given computers and trained in how to access the Internet. An online community was created through the use of the Web, ICQ & email.

For 11 months, Casey Youth, and two groups of university students, 'Mentors' and 'Hypernauts', were engaged in working toward 36 goals Casey had for its youth in a project called Casey Cougar Camp (CCC). 20 of these goals were predominantly technical (Youth will be able to use search engines, Youth will be able to FTP . . .) while 16 were predominantly social (Youth will work in a team, Youth will understand the importance of multiple cultures as they contribute to community . . .). Through a formal and informal curriculum comprised of Activities (College Search, Newsletter Compilation), Forums (online debates about the merits of school, debates about the best vocal performer, shaired New Year's Resolutions) and Chats, a community was created targeting these goals.

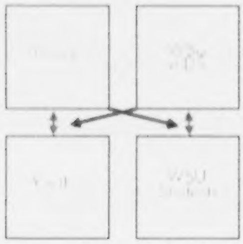
To manage that interaction between Youth and WSU Mentors & Hypernauts, Casey and WSU needed to establish a temporary system, a virtual organization.

To manage everything from communication lines in case of emergency, to billing and tracking of computers and services, Casey and WSU interacted by: email, telephone, chats, and visits; in that order of use.



Interaction between Youth and WSU students mimicked that of the administrative teams negotiating the interaction. Or vice versa.

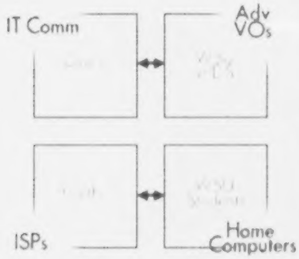
Youth met at a summer camp for 10 days, to establish friendships, to train on computers, and to develop rapport with Mentors. Casey leaders and WSU administrators had similar F2F interactions then shifted to mostly online communication modes.



Whether explicit or not, there were expectations of each organization by the other. Presumably WSU wanted Casey to fulfill its goal of enhancing technology use by its Youth and Staff. Casey presumably wanted WSU students and faculty to gain knowledge about at-risk youth.

Each group wanted to affect change and may have expected to be changed by the partnership.

Beyond the expected transformations, there were some unintended growth opportunities uncovered by this partnership. While the dynamics and limitations of traditional interactions (vertical interactions described by gray arrows in the figure above) were most apparent to participants; the new needs of one partner were more obvious to other partners. This distant perspective and the participation in an experimental interaction between traditional service entity (Casey) and its client (their foster youth) exposed several opportunities for growth and change in practice and expectations. (For instances, several times over the course of this activity Casey leaders and vPDS staff speculated about a time when the list of minimum requirements for participation as a Casey Foster Home would grow from ". . . electricity, hot running water, & telephone service" to include computer and an ISP.") It became clear that this partnership was going to change the expectations of all involved.



It is clear that both individuals and organizations uncovered new areas for growth and expansion. WSU vPDS learned it needed a better way to enact temporary systems and virtual organizational management schemes.

There is some hint that youth learned they needed ISPs; Students, home computers, and Casey, a more advanced IT communications system.

This unexpected growth in practices, or recognition of new needs, is a clear sign of true transactional partnerships. This trend of transformation (versus transaction) characterized many but not all aspects of this partnership. The satisfying, although challenging, aspects or this partnership were transformational, the unsatisfying ones were transactional.

(Policy Prelude: Try entering partnerships only if you are willing to find out if you or your organization needs to grow and change.)

The Lessons Learned

During the course of the partnership several lessons were learned:

- A good partnership should invest in a virtual organizational structure.
- In a good partnership, each organization can use the other for accountability and evaluation.
- There is a key transition in the relationship of partners when the partnership is based on transformational values rather than transactional values.

A good partnership should invest in a virtual organizational structure.

Toward the end of the CCC while we were attempting to transfer the expenses of the ISP to the homes of the Youth involved, we encountered a problem which would not have existed if we had had a virtual organization. In essence, WSU was trying to terminate a service that Casey was providing, and the service provider didn't recognize WSU's authority to do that. Had we instituted billing and management from a virtual organization called CCC (Casey Cougar Camp), we could have all acted with authority to provide and end services. Instead, we used existing structures within each of our organizations to bill, ship, and pay salaries. (We were very lucky that difficulties ending ISP services was our only organizational disaster story.) In cases where two functions straddle two organizations, creating a virtual organizational structure seems worthwhile.

In good partner relationships, each organization can use the other for accountability and evaluation.

Through the course of this partnership, WSU often used the Casey organization to keep aspects of the operation accountable. Phone logs, Youth progress logs, and online transcripts provided live unbiased testimony to the efforts and progress of CCC Youth and Mentors. More than once, WSU used Casey to bring the difficult message of accountability to Mentors who were showing statistically significant differences in effort or performance.

The injection of other organization's expectations into our daily practices helps us evaluate our own performance.

There is a key transition in the relation ship of partners when the partnership is based in transformational values rather than transactional values.

We hypothesize that the use of transformational activities (versus transactional) characterize successful partnerships and that partnerships predicated on transactions are limited, miss-named, or doomed to be frustrating. The distinction between transactional versus transformational has been outlined it two different arenas, classrooms and leadership.

Phillip Jackson in 1968, studied an educational setting and discovered two types of learning taking place.

- Transactional learning, is a situation where one bargains with learners to learn, and negotiates compromises about how much and what type of learning occurs.
- Transformational learning is a situation where all participants are active in learning and where learners take responsibility for the types and depths of the knowledge acquired.

Here is another view of the same two types of interaction, this example is from leadership but it is not or should not be unlike the relationship between instructors and students.

Political scientist James MacGregor Burns uses a similar formulation in his 1978 work on leadership.

- Transactional leadership is a limited compromise based on the mutual agreements of leader and follower; if you will perform Q for me I will award you Z.
- Transforming leadership is an expansive agreement between leader and follower based on mutual benefit. A leader finds goals within the follower and helps the follower achieve these goals with in a larger context of an organization. Leader: I help you achieve your goals in the context of our mutual organizational effort.

We found our attempts to bargain with learners, employees, or partners unsatisfying and generally produced limited results. We found that when our mutual goals coincided, growth and transformation was easy and fun.

An interesting transition of the CCC partnership occured in December of 1998. Casey and WSU each seemed to realize that the project had expanded in scope and focus and began a new set of relationships built on trust and an expectation of transformation. Where the specific transactions were negotiated and specified earlier, WSU now had license to freely configure resources to manage the project within its initial budget.

Very early in the Spring of 1999, the Hypernauts were introduced as content participants and peer advisors and an IT troubleshooter was introduced to assist in the technology problems. While these changes seem minor, they went outside the contractual plan and may have seriously hampered the partnership while it was still in its transactional phase.

The Policy Issues Raised

During the course of the partnership several policy level issues arose:

- Partnerships transform the duties and boundaries of each organization.
- Partnerships cost each party more (in unexpected/ unplanned ways) than a grant/contract scenario.
- Technologically enhanced partnerships challenge the established hierarchy and communications patterns of organizations.

We will describe each policy implication and provide evidence that this is a universal finding not specific to our partnership.

Partnerships transform the duties and boundaries of each organization.

During the course of the project, the transformation in the delivery methods and outcomes moved our activities out beyond many of the: (a) original Memos of Agreement between organizations, (b) job descriptions of employees and (c) expectations of youth participants. This was mostly due to the advances in practice, not to changes in the technology used.

However, the ongoing change due to technology often made technology, not the actual practices themselves, a scapegoat for dissatisfaction.

Development of a new online environment and development of database logs each contributed to redefining the duties and relationships between partners. The online environment of the CCC was created well after each group reached agreements on the modes of interaction. This meant changes to the expectations made of Youth and of Mentors. Had these agreements been immutable, the CCC would have been operating on 18 month old, hopelessly passe, technology. An experimental enterprise, such as ours, shackled to the technology that was current during the negotiation phase of the partnership, would be hampered by a transactional agreement.

While some changes in technologies simply changed the technical mechanics, such as the example above, others technological changes had more fundamental changes in roles and responsibilities, as demonstrated below. Changes in the mechanisms of logging and reporting Mentor-Youth interactions were made due to the advances in online databases. This was another example of technology advancing beyond the initial negotiated agreements. The implications of this advance were broader than the simple method of record keeping; in this instance the online nature of these databases allowed the Casey staff, administrators, Social workers, and possibly foster parents to view the progress of the Youth (an weekly online report card). This reporting advance, combined with the ease of analysis of primary documents in the online environment facilitated rapid analysis of camper progress by Casey administrators, Social Workers, WSU administrators, and theoretically parents. Where we had originally planned for WSU to report Casey on the progress of Youth, Casey was now in a position to directly review Youths' work, our records of Youths' progress, and inquire from Mentors their perspectives on that progress. The key feature of this change is a shift in the progress documenting role of the Mentors, from reporters with large editing and filtering powers, to archivists and catalogers of primary documents, with no filtering or editing capabilities.

Another example of changes in duties brought on by transformation during the partnership was the shift of Mentors from camp counselora to IT help desk staff. When the IT Help need arose, the transition was difficult because the implicit contract between WSU and Mentors was stated in terms of counselor and did not properly anticipate the magnitude of IT issues that Youth would face.

Changes in the online environment and the incorporation of the database logging Youth progress suggest that participants in transformational partnerships should invest more broadly and widely in terms of the envelope of expected duties. This is natural in a transformational partnership pampered by good resources to inject into the partnertship.

Example of partnerships transcending traditional boundaries: IBM, Motorola, & Apple made a new company to make chips. They built all the parts of a new company for this venture. It was a transformational partnership because each hoped that it would change their organization in important ways. They had a new fiscal agent, management structure, and roles and expectations within the partnership rather than within their old organizations.

Example of the misuse of the word partner: Global Village modems shipped in the Macs we used were not the result of a partnership. Though Apple calls Global Village a "strategic partner" they had very little stake in improving the product or practices of Global Village. Apple would not have invested in reengineering its system or the modems when the modems failed, rather they would cancel the contract for modems. This was a transactional interaction and not a partnership.

Partnerships cost each party more than a grant/contract scenario.

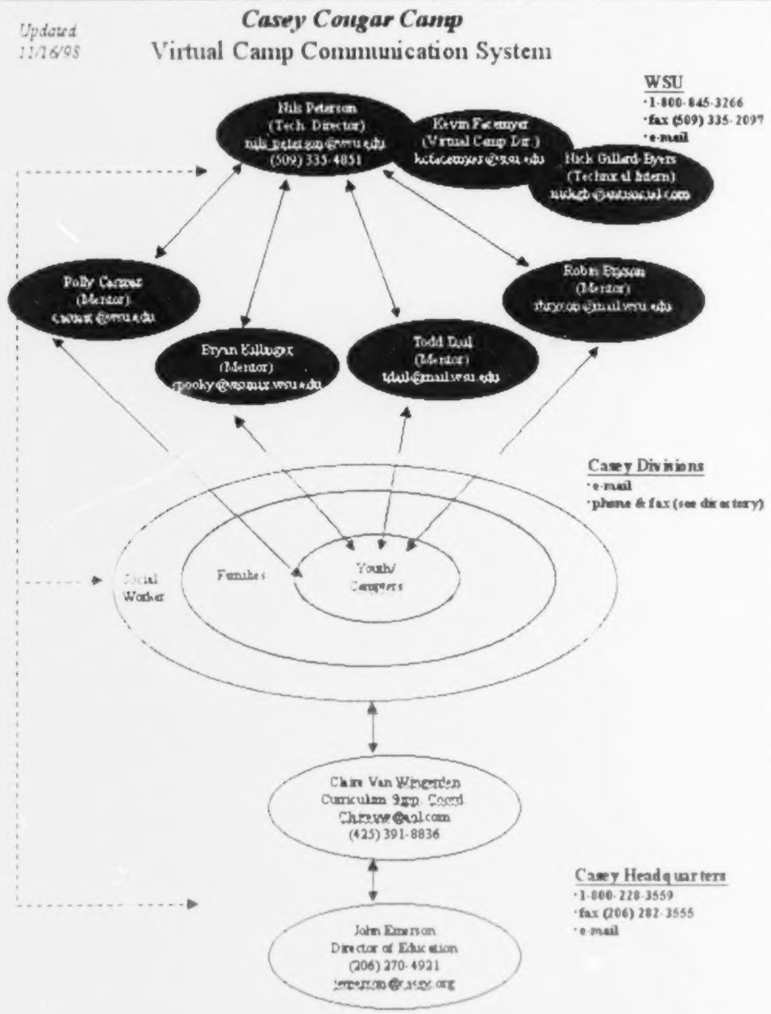
It has not been our experience that partnerships save money. Partnerships expand the scope of each organization's enterprises and challenge each organization's budgets and resources.

Partners spend more to make it work. In this partnership Casey experienced a significant cost overrun for ISP services for Youth. WSU experienced a talent exhaustion of its Mentors and had to enlist the aid of Hypernauts as a critical thinking SWAT team to engage the CCC Youth in curriculum and activities. WSU had to invest in a full time IT trouble shooter to remediate the unexpectedly high rate of technical failures experienced by the CCC Youth. Each of these were unplanned expenses.

A supposition: Any partnership that does not stretch the limits or budgets of the organizations entering it, is an alignment of oprganizations too similar in character to benefit form the partnership in any way other than a cost savings due to scale. Neither organization will be transformed.

Technologically enhanced partnerships challenge the hierarchy and communications patterns of organizations.

A corporate communication chart was drawn up to facilitate communication pathways between Casey and WSU. The ease and availability of almost all email addresses of all possible contacts in the two organizations challenged the traditional communication lines and hierarchies.


Updated 11/16/98
Casey Cougar Camp
Virtual Camp Communication System
WSU
·1-800-845-3266
·fax (509) 335-2097
·e-mail
Nils Peterson (Tech. Director) nils_peterson@wsu.edu (509) 335-4851
Kevin Facemyer (Virtual Camp Dir.) kcfacemyer@wsu.edu
Nick Gillard-Byers (Technical Intern)
Polly Carrez (Mentor)
Bryan Killinger (Mentor) spooky@wsunix.wsu.edu
Todd Dail (Mentor) tdail@mail.wsu.edu
Robin Ehyson (Mentor)
Casey Divisions
·e-mail
·phone & fax (see directory)
Social Worker
Families
Youth/ Campers
Claire Van Wingerden Curriculum Supp. Coord. (425) 391-8836
Casey Headquarters
·1-800-228-3559
·fax (206) 282-3555
·e-mail
John Emerson Director of Education (206) 270-4921 jemerson@casey.org

The communication chart at left fails to emphasize the large amount of communication between Claire and Mentors. One path of communications which is not even specified was used often, that of the Mentor-Social Worker contacts. (Social Workers largely did not participate in email.)

This chart implies that there was very little interaction between WSU administrators, Nils, Kevin, & Nick and Youth. Little could be further from the truth. John was also extensively involved in interacting with Youth.

These traditional pathways dissolved in the face of ubiquitous email address sharing and instant message services like AOL Instant Messenger and ICQ.

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This partnership was enhanced by technology and that technology changed the methods of interaction and the character of that interaction. Most of that change centered on lowering communication barriers, and involving more individuals from each organization to do more at the level of the Youth. This is important. *If your organization does not want to participate in the wave of "disintermediation" of organizational development now passing through our organizations, avoid a transformational partnership that will involve communications technology.*

The Best Ways Technology Should Be Used In The Future

- to extend communities,
- to enrich collaboration, and
- to link together research, teaching, and public service.

Extend Communities

Today, using online technologies to create or extend community for specific populations seems to be an obvious conclusion, but in 1995-98 when the CCC partnership was created it was only an untested premise.

When Tomikia and I (Kevin) first met face to face in July 1999, she said "Nice to see you again" not "Nice to meet you". (She and I online met about 9 months earlier.) Tomikia's experience within the online community was rich enough that she and many other participants thought of it as a real place. Not just a metaphor anymore, Youth would "go" to the Speakeasy Café, where the Chats, Shared Writings and Projects were. Whether this is just a metaphorical construction in the language of participants or not as important as the level and amount of community established there, the amount of affiliation and belonging each participant had to the community. (It varied among paticipants of course.)

One youth stated after the year long experience, *"We lived in different cites, we don't see each other, and its hard to visit places so far away, but we were able to stay connected. The best part of CCC was interacting with people using email. Camp was very encouraging."*

This testimonial seems to support the contention that technology enhanced communities exist where they would not have without technology.

The extension of community into the dynamic interdisciplinary boundaries of research (Vaisman, 1995) supports the contention that there is a large potential for technology and online communities to transform our definition of community. Currently we are proposing that there is a new type of groupwork called *metacommunity*. It is predominated by neither vertical nor horizontal interactions, it is based on a flattened hierarchy, and it is dispersed in space and distinctly different from the local culture and local community.

We believe that the CCC and the administrative virtual organization supporting it, researching it, and evaluating it, were a metacommunity.

The Youth probably viewed the community as 40 Youth, 7 adults, and 3 administrators. But like actors unaware of their performances in a play, there was a whole support system of evaluators, curriculum designers, online webspace designers, and builders. Had you asked what predominated the Mentors' "culture" day to day, you would not have heard about their participation in WSU graduate school, you would have heard them talk about CCC as their primary cultural experience. The WSU vPDS management team had similar experiences, belonging more to the CCC project than their home cultures. This suggests that they were involved in a metacommunity.

The distinction we have made about transactional partnerships and metacommunities is that participants are in neither partner's home culture, nor are they in a brand new organization. They are straddling two communities. As this balancing act is maintained, it would be good to remember that during a transformational partnership you might need to spend some time/resources up front to make the metacommunity, outside the client-provider, contracted interaction. By making and endorsing boundary-less communications, you need not be driven into compromised practices.

Two things will enhance community; (1) active creation and attention to community through technological enhancement and, (2) dedicated, endorsed changes in the partnership culture.

These issues are sometime illuminated by the limits of the partnership involved. In our case, foster families didn't come in, the Board of Trustees didn't come in when invited. Also, other kids didn't feel excluded by not being able to come in. These limits describe the edges of our partnership and the limits of our particular metacommunity.

Enrich Collaboration

We offer up this metacommunity hypothesis, because we think the intellectual tools and vocabulary of online community creation fail to recognize important features of a spatially dispersed, non-vertical, non-horizontal, flattened hierarchical, community which is distinctly different from the local culture and local community. We don't need jargon, but sometimes we do need a new knowledge label. If there is such as thing as a metacommunity, then active and knowledgeable entry of partners into this type of relationship could enrich collaboration.

Another youth reflected on their use of the technology for a college search. *"CCC really influenced my career decision. I went from hating computers to loving them. The college project helped me go to web sites and see pictures of the colleges and learn about their programs. I can now use the scholarship tables, the online essays and applications."*

The dual elements of enhanced technology and elevated practices combine to allow fruitful interactions.

An interesting test of these enriched collaborations occurred during a suspected crises involving one of the Youth. Information moved very quickly through the natural communication channels without relying on the formal communication diagram or protocols.

Link Together Research, Teaching, And Public Service

Little advances this argument more than John Emerson's summary statement about the Casey-WSU partnership and the CCC's use of technology to further the agendas of Research, Teaching, and Public Service. His statement provides an interesting context and summary of this partnership and conclusion to this work.

John Emerson

The Casey Family Program's commitment to exploring how technology might play a significant role in preparing youth in foster care to take their rightful place as contributing members of their communities is exemplified in its 1995-2000 Strategic Plan, *"Building Toward A New Century"* (The Casey Family Program, 1995). Goal 13 states: "By the year 2000 improved technological connections among Casey staff, foster parents, youth, and the communities in which they live and work will be an integral part of Casey life, yielding better mutual understanding, increased access to resources and information, more targeted work, and improved collaboration". Providing leadership to Casey communities in the uses of technology for the improvement of services to youth and the enhancement of communication translated into a variety of initiatives by Casey divisions and the organization as a whole.

Several assumptions about how best to deliver quality long-term care to foster youth and families while preparing them to enjoy a high quality of life in an ever-increasing technological world grounded Casey's efforts. Among these were:

- Enriched environments to maximize their emotional, physical, intellectual, and spiritual potential
- Thoughtfully planned educational and vocational opportunities that allow each child to develop at their own pace
- To grasp the implications and acquire the disciplines necessary to function as citizens of the world

Information and technology are understood as central to achieving these outcomes. Being able to access the knowledge developed in other settings and engaging others in conversations about how this information might be best utilized to achieve personally fulfilling goals in seen as critical for finding success and satisfaction in the technological age. For at-risk youth who find themselves in long term foster care, technological advancements and related skill attainment offer a highly effective opportunity to make important connections to their peers, communities and the world. Because of their special status highlighted by instability and learning deficiencies, students in the foster care system too often find themselves left out of innovative educational advances, especially technologically focused innovations. *"Casey Cougar Camp"* provided Casey and its partner, Washington State University, with a unique opportunity to connect a group of at-risk youth distributed across the country and see what kind of a community and learning might result.

After carefully examining the many challenges and successes of this innovative online community effort, *The Casey Family Program* is encouraged that this and other developing technologies can play an important role in providing youth, their families, support staff and community partners with an effective means to help achieve greater independence. We are currently proceeding with a follow-up project to provide several hundred of our families with laptop computers and internet connections. This will enable them to better communicate with the professional support staff, school personnel, and most importantly, with each other. The promise of online communities and improved technological learning opportunities to promote educational, career, living, social and leisure outcomes for a population that has traditionally experienced very low levels of independence will continue to be actively explored by *The Casey Family Program* in collaboration with community partners.

Full community integration, hopes for the future, independent living, educational attainment, career success and making satisfying connections. These are the outcomes that *The Casey Family Program* values for foster youth everywhere. The technological innovations explored through *"Casey Cougar Camp"* hold great promise to enhance the lives of youths who for too long have found themselves at the fringes of our communities.

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Abstract

Category: Papers Presented at EDUCAUSE annual conferences

ID Number:	EDU9937
Title:	Virtual U: The University Simulation Game
Author:	William F. Massy
Organization:	The Jackson Hole Higher Education Group
Year:	1999
Abstract:	The Virtual U Project is a simulation product created to help improve the management of the nation's university systems. Virtual U simulates running a university or college and assists management in allocating resources within the university. It is a powerful and user-friendly software tool that models the attitudes and behaviors of an academic community. The tool is driven by a powerful simulation engine that draws on an extensive compilation of data concerning the U.S. higher education system. Players determine policies for resource allocation, faculty hiring, enrollment management, and consider other decisions that college and university administrators face. Virtual U is the beginning of a new genre of interactive tools for educational systems.

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Virtual U:
The University Simulation Game*

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Virtual U is a computer simulation game under development that will engage participants in exercises designed to improve understanding of universities as systems. Participants will take the point of view of a university president. They will set institutional and departmental budgets and make decisions in areas such as faculty hiring and compensation, enrollment management, incentives for teaching and research, finance, facilities, and even parking. The graphic interface is based on modern computer gaming technology (Windows 95 or 98). The simulation model is based on the latest available research, and it will be documented in due course. The Virtual U team seeks collaborators to help determine the best modes of usage and to explore the possibilities of customization.

Colleges and universities are complex and arcane enterprises. Few people involved in or concerned with higher education understand these institutions as systems. This includes faculty, administrators, students, members of governing boards and state higher education coordinating boards, the higher education press, alumni, parents, and the interested general public. Misconceptions abound, and these adversely affect the higher education policy environment and institutions' ability to govern themselves.

Reacting to the problem, the Sloan Foundation's Jesse Ausubel and I independently conceived the idea of a university simulation game. Simulation provides a tool for the analysis of systems. A game environment invites interaction, which hopefully will motivate the effort needed to grapple with the systems issues. We began outlining the idea in Ausubel, *et al* [1997].

Now Virtual U, also known as "Virtual University," is about to become a reality. Enlight Software of Hong Kong designed and developed the game. Trevor Chan, Enlight's President, is well known in gaming circles for his *Capitalism* and *Seven Kingdoms*. The Jackson Hole Higher Education Group developed the simulation engine, which is an entirely new model although it does draw heavily on my prior work (see the list of resources). Data to drive the engine were collected by the University of Pennsylvania's Institute for Research in Higher Education. The game is now in the last stage of beta testing, and Digitmill, Inc., of Portland, ME, will launch it later this fall. The Alfred P. Sloan Foundation supported the project from its inception.

Overview

Virtual U provides a powerful, convenient, and user-friendly tool by which institutional professional and interested laypersons can participate in leadership challenges in a college or university setting. Users set, monitor, and modify a variety of institutional parameters and policies, allocate resources as they see fit, and watch as results continually unfold. The simulation provides an opportunity to experiment and succeed or fail in a safe and entertaining fantasy environment. While Virtual U is necessarily a caricature of real academic life, it is grounded in authentic conceptual structures and data. It will provide serious lessons in higher education.

Virtual U has been designed as a computer game to help establish motivation and guide users through scenarios and problem-solving challenges. The game will be distributed via CD along with a manual and strategy guide. It is programmed in C++ and operates in a Windows environment. My colleague, Ben Sawyer from Digitmill, will begin demonstrating it shortly.

The game is driven by a powerful simulation engine that uses a combination of micro-analytic and system dynamics methods and draws on an extensive compilation of data on the U.S. higher education system. (CDs with data from other countries could be produced with modest effort.) The simulation specification will be in the public domain, and technical papers describing it will be produced in due course. An expressive graphical interface with extensive help screens and tutorials provides access to the simulation's rich systems environment.

By taking the point of view of the university's president, users get a unique opportunity to see the operation of the institution as a whole. Virtual U's presidents are endowed with an uncannily high degree of omnipotence. They choose the kind of institution they wish manage: e.g., public or private, large or small, prestigious or not. They can make decisions or view operating and financial reports at any time, and they can drill down to the department or even the individual professor level. They determine policies for resource allocation, faculty hiring, enrollment management, and many other decisions faced regularly by college and university administrators. They can set policies consistent with long-term strategies or intervene in specific decisions as desired. Custom simulations allow them to determine their own goals, or they can select scenarios with preset goals. The simulation can continue as long as the institution remains financially viable.

Presidents also must confront chance events: for example, the governor makes a sudden change in the state appropriation, Congress adjusts research funding, or there is a serious fire or scandal on campus. The events may have good or bad consequences, and they may or may not call for an explicit response. The resulting unpredictability can add a useful element of excitement to the simulation, or the chance events can be turned off as in our demonstration today.

Our tour of Virtual U begins with the simulation's startup options and continues through its main interaction screens. At each stage we will demonstrate the interface and briefly describe the key elements of the underlying model. The model will run during the demonstration to allow viewers to experience the evolution of our virtual university.

[*Launch the simulation; pause to view the opening animation.*]

What Issues? What University?

Players may choose a custom simulation, a scenario simulation, or an express simulation. Scenarios present a specific challenge and offer particular success criteria. For example:

Allocate new money:

New money provides an opportunity to improve academic quality and institutional prestige, but it is all too easy to disburse the funds ineffectively. Having just received a pledge for a major gift to endowment, you will be asked to allocate the extra income flow to one or more departments in a broad field specified by the donor. You will be judged by the increase in institutional prestige and by the institution's overall performance over a ten-year period.

The complete list of scenarios follows:

Balance the budget

Pay better

Allocate new money

Teach better

Improve research performance

Win games

Control tuition increases

Limit enrollment shifts

Enroll more minority students

Hire more minority faculty

Each scenario may be run for a college or university with public or private control.

The *custom setting* allows presidents to choose their own issues and fine tune their environment. The first step is to select up to fifteen departments from a list of 38 departments for which data have been provided. Departments can be added to or subtracted from a ten-item default set. The selected departments will operate throughout the simulation.

The two *advanced options* screens present presidents with choices about student numbers and characteristics, institutional prestige and financial condition, and various other attributes of the school and its students. For example, the school can cater to traditional, nontraditional, or distance students, be mainly residential or non-residential, include graduate students as well as undergraduates, and stress research or not.

The model uses data from 1200 four-year institutions to produce a realistic representation based on the president's specifications. The inputs provide targets and weights for a distance index (a weighted sum of squared deviations), which is calculated for each institution in the database. Average financial and operating information for the ten institutions with the smallest indices provide the simulation's initial conditions. The model runs for an academic year (year 00) to dissipate startup transients and then turns itself over to the president at the beginning of year 01. A "welcoming letter" from the simulated Board of Trustees orients the president to the kind of institution he or she has created.

[*Launch a simulation. Stop it early in August before the first budget round.*]

Express simulations provide a quick-start capability for people who want to move immediately to a challenging situation. They were generated using the custom procedure, run to a point judged to be interesting, and then saved and stored on the CD. The express simulations offer no design options or welcoming letter.

The Campus

The campus map provides visual orientation and one of several navigation tools. Clicking on a building brings up information relevant to that activity—for example, an academic department, Old Main (administration), the Development or Admissions Office, or the stadium and field house. The map is static during play (moving figures would have consumed too many machine cycles), but it depends on whether the campus setting is urban, suburban, or rural.

Six "dashboard" indicators track the evolution of key data series: for example, enrollment and sponsored research, selectivity, faculty and student morale, and financial performance. The president can gain more information by clicking on the appropriate building or toolbar item.

[*Click on the Faculty tool and follow along with the text.*]

The Faculty

"The faculty *are* the university," so the saying goes. Virtual U simulates each faculty member as an individual—that is, as a "sim" with its own characteristics, behavior, and history. The sims are organized by departmental affiliation, gender, ethnicity (majority or minority), and academic rank (assistant, associate, or full professor, short or long term adjunct). The two *Profile* screens report numbers and percentages at the departmental and institutional levels.

The *Detail* screens illuminate the simulation's operation at the micro level. Faculty attributes include talent for teaching, scholarship, and research, current performance on each dimension, age, salary level, and degree of job satisfaction (morale). Scholarship has its own category to emphasize its breadth relative to traditional research [Boyer, *et al*, 1991]. Subject to presidential influence, departments assign teaching loads and professors allocate their discretionary time among class preparation, out-of-class student contact, course development, scholarship, and research (see Zemsky, *et al*, 1999, for a sample time utilization model). The total workweek varies due to teaching loads, research projects, morale, and other factors. Professors submit proposals for sponsored research that may or may not result in project awards. The president sets policies that govern the kinds of faculty to be hired and the distribution of salary increases. Professors become happy or frustrated, and they may retire or leave the institution for other reasons. While the president may not wish to view the individual faculty sims, the information is there if needed.

The *Activities* screens summarize the faculty's behavior as it evolves during play. They also allow players to influence the behavior. For example, departments develop norms for teaching load [Massy and Zemsky, 1994], but actual loads may deviate from the norms due to presidential policy and enrollment demand. The sims' talent profiles affect their intrinsic preferences for use of discretionary time (e.g., high research talent means a stronger desire for research time) but this, too, may be influenced by presidential policy. Attempts to influence teaching loads and discretionary time may or may not produce significant change, but they always carry morale and performance penalties.

Faculty submit *sponsored research* proposals according to a Poisson process with probability dependent on field, research talent, time spent on research, and the school's research emphasis. A proposal gestates for a period of months, after which an award of a particular size may or may not be forthcoming. The award probabilities depend on the researcher's talent and recent performance, applicable infrastructure, the department's and school's research reputation, and the overhead rate charged on sponsored research projects. A project generates direct research expenditures for the department and overhead recovery for the institution until it expires after about a year. Time series provide research volume data and a bar chart shows proposals, awards, and rejections. The panel at the right of the screen allows the player to change the overhead rate either immediately or prospectively. (Similar panels appear on other screens.) I'll explain its operation in the context of budget setting.

Faculty morale (on the *Activities* screen) depends on factors like salary, teaching load, presidential efforts to influence discretionary time, and performance. Faculty and student diversity influence minority and female professors' morale. Teaching, scholarship, and research performance depend on talent, time on task, morale and other factors like expenditures on libraries, information technology, and facilities. Faculty teaching performance, student quality, teaching load, instructional methodology, and class size affect teaching quality.

These effects (and many others) operate through single or dual logistic response functions, classic s-shaped curves or stacked pairs of s-shaped curves, which have been parameterized judgmentally. The single logistic's maximum sensitivity occurs at the center of its range. The dual logistic allows for low sensitivities at the center and then asymmetrically larger ones on each side until the upper and lower asymptotes are approached. Both functions constrain their outputs to a preset range, which prevents the model from running away. Latency functions of the form $y_t = l\, y_{t-1} + (1-l)\, x_t$, where x_t is the response function output, provide additional stability and realism.

Professors progress from year to year according to a Markov process with transition probabilities for "promote", "depart", and "continue in rank but one year older." (Parameterization was informed by Massy and Goldman, 1995.) A sim's transition probabilities depend on salary, morale, and performance. The president can influence them by adjusting the policies on the *Promotion* screen. The continuation probability for assistant professors goes to zero after seven years, and the one for full professors declines as the sim passes age 55. Associate and full professors have tenure, but the president may induce them to take early retirement with a suitable buyout offer.

The *Salary* screen allows the president to set policy for distributing the university's annual faculty salary pool. Preference may be given to certain departments, ranks, and/or gender ethnic groups. They are implemented each August after the budget has been determined. The *Hiring* screen sets policy for faculty hiring, which also takes place in late August. Policy variables include preferences for rank (e.g., leadership or new blood), gender-ethnic status, and different kinds of talent. All policies stay in place until modified. The budget determines how many faculty members each department can hire. Then a linear program maximizes the president's preferences subject to the hiring limit and market constraints based on salary and availability.

[*Click on the Students tool and follow along.*]

Students

Students are simulated as individuals just like faculty, but there are no detail reports. (Student sims can run in the high thousands, whereas faculty sims number in the hundreds.) *Profiles* by student type and gender-ethnic group summarize the composition of enrollment at the departmental and institutional levels. Students may be full-time or part-time undergraduates, masters, doctoral, or distance learners (for simplicity they are also undergraduates). Student attributes include academic talent rating, academic performance, morale, major department, and number of courses accrued for graduation. Full-time undergraduates also possess extracurricular and athletic talent ratings.

Virtual U's *Admissions Office* (a freestanding operation with its own building and interface screens) extends offers to prospective students, manages financial aid, and tracks applications and yield rates. The president determines target student numbers for each level except doctorates and set priorities governing the kinds of students to be admitted and the allocation of financial aid. (Departments admit their own doctoral students without presidential intervention, and all doctoral students receive full financial aid.) For example, admissions and financial aid for full-time undergraduates may favor academic, extracurricular, or athletic talent, and aid may be need based or merit based. The Admissions Office sets intake targets to maintain the president's desired student numbers after taking account of graduations, dropouts, and expected yield rates. It uses linear programming to maximize the priorities for full-time undergraduates, subject to the intake target and market conditions.

The market model for full-time undergraduates classifies potential applicants into seven market segments. (Such students represent the bulk of Virtual U's enrollments and more data are available for them than for other student types.) The segments are:

- *Blue Chip:* students with top academic and extracurricular qualifications
- *Scholar:* students with top academic qualifications
- *Extracurricular:* students with top extracurricular qualifications
- *Athlete:* students with top athletic qualifications
- *Balanced:* students with respectable academic and extracurricular qualifications
- *Average:* students with unremarkable academic, extracurricular, and athletic qualifications
- *Stretch:* students for which college represents a "stretch" goal because of shortfalls in ability or preparation

I used data from the National Education Longitudinal Study (NELS) to determine segment sizes and characteristics and the effects of institutional attributes on application and yield preferences. Institutions were classified according to Zemsky's seven-way typology [The Landscape, 1997] for purposes of model calibration. Virtual U's current characteristics are mapped into the typology as the simulation proceeds.

The admissions algorithm generates the number of applications, admissions offers, and matriculations for each full-time undergraduate segment. A simplified algorithm not involving segments or linear programming generates applications, offers, and matriculations for the other student levels. Reports on the process are available within the Admissions Office.

The *Student Activity* screen reports on student talent, morale, degrees awarded, average time to degree, and dropout rates—again, both at the departmental and institutional levels. Students graduate when they have accumulated the requisite number of courses (a full load is four courses per trimester). The requirement is 32 courses for undergraduate degrees, 8 for masters degrees, and 16 (plus a dissertation period of about a year) for doctoral degrees. Students may speed their progress by taking courses in the summer, and the president can encourage them to do so. Year-around operation (which requires the strongest intervention) optimizes the use of facilities and other scarce resources, but at a potential cost in student and faculty morale. Students who do not graduate during a given year may drop out with transition probabilities determined partly by academic performance.

Additional information specific to full-time undergraduates can be found on the *Undergraduates* screen: for example, the extracurricular and athletic ratings. The *Student residences* screen shows the fractions of full-time undergraduates who live on campus, plus the tuition and room and board rates.

The *Athletics Program* (reached by clicking on the stadium or arena) fields football and women's basketball teams at a presidentially determined level of intercollegiate competition. Win-loss records depend on student athletic talent, which is influenced by the player's admission and financial aid priorities, and on athletics program expenditures in relation to the level of competition. Revenue depends on the level of competition and the win-loss record. The record also affects student and alumni morale, fund raising, and other aspects of university life.

[*Click on the Courses tool and follow along.*]

Courses

The *Course* report arrays the number of enrollments—the result of matching course supply and demand—by department and for the institution as a whole. Full-time students seek to take four courses in each of two trimesters. Generally these are in the fall and spring, but some students select the summer as a regular trimester. Part-time students and distance learners take half the normal number of courses. Professors want to teach at or below their normal loads, but they will accept somewhat higher loads if the occasion demands.

Undergraduates use a probability vector based on empirical enrollment data to select a major at the end of their first year. Masters and doctoral students enter directly into a department. We estimated the concentration, distribution, and elective requirements for each major (and for general education) by sampling course catalogues. Following research on curricular structure [Massy and Zemsky 1997], the model categorizes each department's courses according to "depth" and "focus." Depth refers to the number of departmental courses typically taken before this course. Focus refers to whether the course is usually taken during an undergraduate's first two years (lower division), last two years (upper division), or by graduate students.

Each major's requirements database specifies the number of courses needed from each department-focus combination and depth classification, which determines the number and precedence of prerequisites. Each sim accumulates a list of requirements completed and selects the next semester's courses according to the most pressing requirements yet to be attained. (For example, a requirement with a prerequisite is more pressing than one with no prerequisite.) Two problems may delay a student's orderly progression toward graduation: denial of entry into courses or failure after a course has been taken. (These are reported in the last two columns of the enrollment table.) Denial occurs when the supply of spaces in a particular course category falls short of demand as described below. Students may try to substitute another course in this case, but it will be one of lower priority. Low student academic talent and poor educational quality may conspire to produce course failure. Failure means the student must retake the course, which slows progress toward graduation.

Supply side effects derive from the faculty's preference for one or another teaching method, faculty size, and permissible teaching loads. Again following Massy and Zemsky [1997], the three teaching methods are large lectures with breakout sections, small seminars, and general courses. Seminars produce more learning and large lectures less, other things being equal, but resource requirements differ. Departments have a preferred teaching method mix, which the president may seek to influence, and each method has an ideal class size that may vary by department. Actual class size may exceed the ideal by a certain percentage, but this will erode morale and educational quality.

Supply-demand matching starts with course selection by doctoral students, who have first priority for spaces. Then come masters students, full-time undergraduates, nontraditional undergraduates, and distance learners. (Substantially larger class size limits for distance students simulate a virtual learning environment.) The first selection initiates a new course in the indicated department and depth-focus category, to which a randomly selected faculty member will be assigned. The teaching method also will be chosen at random based on the department's current preference vector. Then the process continues until all students have made the requisite number of selections for the trimester, at which point the demand-supply matching will have been completed.

The demand limit is reached when all sims have selected their complement of courses. Supply limits arise when (a) all faculty have been assigned their maximum teaching loads and (b) all courses have reached their maximum enrollments. The supply constraint can bind in some departments and not others. Demand shortfalls reduce teaching loads. Such shortfalls boost the unit cost of instruction but give faculty more time for other activities including research. Supply shortfalls increase time to degree and, therefore, dropout rates. Players can increase demand by admitting more students and increase supply by adding faculty, pushing up teaching loads, or shifting the teaching method mix away from seminars and toward lectures. Each act carries its own set of consequences, so tradeoffs will be required.

[*Click on the Finance tool.*]

Finance and Related Offices

Teaching and research form the academic heart of the university, but the heart can't function without money to circulate. The *Finance* tool provides visibility on the university's sources and uses of funds and balance sheet, and access to the policies that guide the annual budgeting process.

Funds sources include net tuition revenue (tuition rate times student FTEs minus financial aid), sponsored research, gifts for current use, spending from endowment, and (for public institutions) state appropriation. Uses are classified by function and type. Functions, shown on the *Revenue and Expenditures* display, include departmental expense, direct sponsored research expenditures by principal investigators, libraries, information technology, student life, athletics, fund raising, and administration. There are three expenditure categories: faculty salaries, staff salaries, and "other" (e.g., supplies, communication, and travel). The types are shown along with the functions on the *Detail* display.

Players may transfer funds to a capital reserve for use by the *Facilities Office* in the construction of new buildings and parking structures. Building demands depends on faculty and student numbers, expenditures on research and support services (such expenditures reflect staff numbers), and the depreciation of existing plant. (Space norms like those in Virtual U are used by many public systems around the world.) Parking demand depends on the same factors plus campus setting—urban campuses need more parking structures than rural ones. The Facilities Office tracks space supply, space demand, and space under construction. (Construction takes a year to complete once the work is initiated.) Failure to meet demand erodes educational quality, research performance, and morale.

Facilities can be constructed with *debt*, providing that borrowing limits have not been exceeded, and also with gifts designated for plant. The president decides the fraction of construction to be debt financed and sets the university's debt limit. The bond market sets the ultimate debt limit depending on the school's financial performance and balance sheet.

The *Development Office* reports on fund raising and allows the president to determine how the gifts will be allocated. Gifts for current operations go to support the budget while endowment and plant gifts are added directly to the balance sheet. Fund raising success depends on university academic, financial, and athletics performance and on expenditures for development.

The *Investment Office* reports endowment total return and allows players to set the spending rate and allocate assets among bonds and large and small capitalization stocks. Small-cap stocks offer the highest return but they are the most risky. The spending rate is set during the budget process, but it can be adjusted within the Investment Office. The president also can choose the degree of smoothing to be applied to endowment spending. Smoothing dampens stock market fluctuations at the cost of larger asset value variations.

[*Click the Budget button under Finance.*]

Resource Allocation

The *Budget* report displays the policies that govern resource allocation. Budgeting proceeds in three stages: determination of (a) overall revenues and expenditures, (b) the distribution of budget enhancements and cuts by function, and (c) the allocation of faculty hiring authorizations among departments. The model's default setting requires hands-on attention each year to the trustees' evaluation letter, the year-end financial statements, and the details of budgeting. The menu tool allows conversion to automatic mode, where the president sets budget policies in advance for execution without pausing at year end.

[*Run the game to the annual budget exercise and cycle through to the stage 1 budget.*]

Overall revenues and expenditures depend on what financial officers call "budget guidelines." These include the planned growth rates of tuition and financial aid, the endowment spending rate, the research overhead rate, the size of the salary increase pools for faculty and staff, and the transfer to the capital reserve. (Provision for other expense growth has been preset and debt service depends on the amount of borrowing.) The overhead rate will be applied to new research proposals and the faculty salary pool will be allocated to individual sims once budgeting has been completed.

Two more policy variables are required to complete the budget guideline specification. Following Hopkins and Massy [1981, Chapter 3], "net budget change" represents the total spending increase or decrease after taking account of salary change and other cost-rise factors. The "surplus-deficit" variable represents the budget's bottom line expressed as a percentage of total expenditures.

Players can manipulate the target, the acceptable upper and lower limits, and the priority to be associated with each policy [*demonstrate*]. The overhead rate is further constrained by the university's simulated A-21 calculation. The display also reports the last available result—either from the prior year's budgeting cycle or, in hands-on mode, the last iteration of the current cycle.

Clicking the *Optimize* button [*demonstrate*] activates a quadratic program that simulates the budget staff's efforts to achieve the president's policy targets and limits. Hitting all the targets would require the policies to be mutually consistent, a condition that is unlikely to be met in practice. The model does the best it can by minimizing the weighted sum of squared deviations between the guideline variables in their targets, subject to the acceptability limits and a linear identity that approximates the surplus-deficit in terms of the other variables.

The *Help* screens point out that the simulated budget staff will not be able to honor the whole set of acceptability limits if the limits are too stringent relative to the current financial situation. The model always produces internally consistent budget guidelines, but some of the limits may be violated. The president can redefine the policies and repeat the optimization if the results leave too much to be desired [*demonstrate*].

This is a good time to explain the sponsored research screen's overhead rate adjustment, and by extension the similar adjustments found on other screens. Recall that the president can set a numeric value and then choose among three options: "Consider for next year", "Promise for next year", and "Implement now". The numeric value adjusts the policy target no matter what the option: for example, –3.0% decrements the overhead rate target by three percentage points. "Consider for next year" sets the priority to 2 ("medium", the default value) and "Promise for next year" sets it to 3 ("high priority"). These changes affect the next budget cycle. The president can make further changes during the year, but actions that go against these commitments risk backlash in terms of principal investigator morale.

"Implement now" effects the change immediately, then locks the rate so that it cannot be changed during the ensuing budget cycle.

Stage 2 of the budget process allocates the net budget change, produced in stage 1, across the expenditure functions [*advance to stage 2*]. The targets, limits, priorities, and quadratic program work just as for stage 1. An identity constraint links the sum of the dollar changes to the total change (expressed in dollars) provided for in the budget guidelines.

Departmental expense appears first in the list of expenditure functions. More money for departments means more faculty hiring, and conversely. Additional funds come from vacated positions. The available funds are converted to numbers of faculty positions, which are allocated across departments by linear programming in stage 3 of the budget process [*advance to stage 3 and demonstrate*]. Players can override the calculated numbers of new hires [*demonstrate*], with attendant consequences for the surplus-deficit. Hiring proceeds as described earlier once the budget process has been completed.

[*Finish resource allocation, then click on Performance and follow along.*]

Presidential Performance

Simulations can just run, but games also require a sense of winning or losing. Virtual U players are scored in several ways. All runs produce annual "performance evaluations" and an "ultimate score" that the president may wish to maximize. Scenario simulations bring additional goals that add bonus points to the ultimate score if achieved. Players can view their scores using the *Performance* tool. Additional devices such as the annual trustee evaluation letter and plaques for achieving scenario goals add emphasis and interest.

Maintaining financial viability represents the threshold criterion for presidential success. The university goes bankrupt [*use hidden key to display the graphic*] if deficit spending triggers short-term borrowing needs in excess of what bankers will lend. The player will be warned in time to take remedial action. Failure to do so will terminate the game and negate all other accomplishments [*use the hidden key to exit the graphic*].

The president's annual performance evaluation depends on four groups of factors: output measures, institutional performance indicators, attitudes toward the institution, and financial indicators. There are sixteen factors in all, each of which enters with a particular weight. For example, the *performance indicator* group counts for 35% of the overall evaluation. It consists of institutional prestige (20% of the 35%), educational quality (20%), scholarship (20%), student and faculty diversity (10% each), and the percent of alumni who have given anytime during the last five years (20%). Help definitions are provided and players can track their performance by looking at time series. Each year the simulated Board of Trustees sums up the president's performance in a letter that lists the areas needing improvement.

The ultimate score is calculated according to the following formula, which is displayed prominently [*demonstrate*].

ultimate score = current trustee evaluation x (number of gaming years) +
(current trustee evaluation – initial trustee evaluation) x 10 + total bonus points

The formula recognizes improvements relative to the game's initial conditions, and it also rewards longevity and cumulative accomplishment. Voluntary termination of the game posts the score in the Virtual University Hall of Fame.

[*Terminate the game and demonstrate the Hall of Fame.*]

Concluding Comments

The Virtual U team set out to produce a simulation game that would encourage users to explore the university as a system. We believe we have pushed the state of the art on the simulation side and achieved sufficient playability to make interaction with the simulation an enjoyable experience. Virtual U represents an advance in educational software, and we think the lessons learned can be applied to other subjects.

Virtual U's target market will be, broadly, anyone with an interest in how colleges and universities work as systems. More specifically, we envision the market as:

•higher education administrators

•faculty, especially those in leadership roles (e.g., department chairs)

•trustees

•education analysts, writers, and policymakers

•students of higher education, and in general

•alumni and interested public

Virtual U will be sold to individuals and to institutions for use in connection with retreats and training programs. A separately available strategy guide will help users develop intelligent modes of play and maximize their learning. A Web site is under development.

The team would like to develop a network of expert partners who can design and facilitate group learning approaches based on Virtual U. The team also would like to hear from parties interested in customizing the game to fit new countries or particular institutions. The program is database driven, so it should be possible to tailor the student, faculty, and financial profiles without great difficulty. We also envision a program of research aimed at improving the game's databases, structures, and response functions. Persons interested in any of the above should visit our Web site or contact Ben Sawyer at Digitalmill, Inc., 2 Customs House Wharf, Suite 201, Portland, ME 04101 (207.773.3700, bsawyer@dmill.com).

We are proud of the Virtual U package but also conscious of the improvements that might have been—given less stringent limits on time and money, and if we had known what we know now at the beginning of the project. Virtual U is still very much a work in progress, and it will remain so after launch. The team looks forward to creating a Version 2 if the simulation gets used and produces valuable learning. In closing, let me thank all that worked on the project as well as the Sloan Foundation for its support and patience.

Resources

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Abstract

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ID Number:	EDU9929
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Author:	Lynn M. Lickteig, Robynn F. Tripp
Organization:	University of Colorado at Denver, University of Colorado at Boulder
Year:	1999
Abstract:	Faced with the challenge of providing access to an architecture slide collection to students and faculty on two campuses, the University of Colorado developed an application utilizing state-of-the-art client-server and Web technology to catalog and display information on over 27,000 slides. A collaborative effort of the College of Architecture and Planning and the Information and Technology Services Department, the Visual Information System of Colorado (VISC) provides information about the slide subject and circulation and reservation information about each slide. A lecture module included in VISC enhances faculty support by enabling faculty to reserve and assign slides for specific lectures. This paper will provide an overview of VISC, a summary of the principles underlying its success, and lessons learned during development of the project.

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VISC: Creating a Visual Resource System to Improve Teaching and Learning

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Abstract

Faced with the challenge of providing access to an architecture slide collection to students and faculty on two campuses, the University of Colorado developed an application utilizing state-of-the-art client-server and Web technology to catalog and display information on over 27,000 slides. A collaborative effort of the College of Architecture and Planning and the Information and Technology Services Department, the Visual Information System of Colorado (VISC) provides information about the slide subject and circulation and reservation information about each slide. A lecture module included in VISC enhances faculty support by enabling faculty to reserve and assign slides for specific lectures. This paper will provide an overview of VISC, a summary of the principles underlying its success, and lessons learned during development of the project.

University of Colorado

The University of Colorado is made up of Central Administration and four campuses, including the University of Colorado at Denver, the University of Colorado at Boulder, the University of Colorado at Colorado Springs, and the University of Colorado Health Sciences Center. The Boulder campus, founded in 1876 offers more than 150 fields of study across ten colleges and schools. The campus community includes 2,982 staff and 1,175 faculty members in 270 departments supporting over 25,000 students. The Denver campus, founded in 1912, offers approximately 88 fields of study across eight colleges and schools. The Denver campus includes 732 staff and 763 faculty members supporting over 11,000 students.

College of Architecture and Planning/Visual Resource Center

FIVE TRUTHS: THE CLIENT'S PERSPECTIVE by Lynn Lickteig

I have served for 15 years as Director of the Visual Resource Center at the University of Colorado at Denver's College of Architecture and Planning. Our graduate programs are located in Denver, Colorado, and our undergraduate program is delivered on the Boulder campus. We created a computerized text database for our undergraduate slide collection in 1988. Through a modest $13,000 grant, we paid a private contractor to design this database for us in dBase III. As we expected, the software became outdated, and we wanted to upgrade it to handle image display as well. This pilot database fueled the idea that the College of Architecture and Planning should develop its own image database. We had the cavalier thought that creating another database ourselves would be easy, since we had already worked with a programmer to create the first one. We went looking for funding, and in 1996 received a grant of $35,000.00 from the University of Colorado President's Initiative Fund. My college teamed up with CU/Boulder's Information Technology Services department, which provided matching funds. We then spent two years together creating an image database using Oracle software. We named our product the Visual Information System of Colorado, and refer to it using the acronym, "VISC." After VISC was developed, a second grant provided money to develop a Web interface that we call the Electronic Library of Colorado Architecture, Landscape, and Planning (http://www.cudenver.edu/public/AandP/ELCALP/). The Electronic Library pulls its data and images from the underlying VISC database, and is a good example of how one technology project and one grant can lead quite naturally to another.

Serving as the project manager for the development of two databases and a web interface in the last ten years has led me to realize some simple truths about the factors that must be present for an educational technology project to be successful. From the outset, I want to state that while these truths are extremely simple in theory, many institutions of higher education, particularly in the humanities departments, do not embrace them as fully as they should.

The first truth about technology projects like VISC and our Electronic Library Web site is that you can not do it alone. Collaboration is a must. You will need a small team of people, including everyone from the administrators who control the budget and give the project their political blessing, to the IT programmers who write the code. Also essential are the staff members who enter the data and scan the images, and the faculty members who provide professional input and write funding grants. The collaborative team approach seems so logical, but time and again my colleagues in the Visual Resources Association tell stories of administrators who assume a staff member should be able to single-handedly pull off a technology project, with no decrease in other duties, and no additional staffing to help carry the daily load. And faculty members may voice a willingness to help at the discussion stage, but since technology "service" projects often count very little towards their tenure, promotion, or salary reviews, most faculty members are not willing to give the two to ten hours per week or per month that a technology project might demand from them. And can you blame them? Their success lies in research, not service projects. Clearly the system of rewards would have to change before humanities faculty members embrace serving as mentors for educational technology projects.

The team of people it took to develop the VISC database and the Electronic Library application in the past three years has included: two faculty members, two classified staff members, two technical support staff, five undergraduate students, three graduate students, one Ph.D. student, the five employees of ITS who wrote the VISC database, one private consultant who designed the Web site, one digital image consultant who taught us to scan and set up the equipment, and finally, one content consultant who wrote narratives on buildings and architects, and who helped us catalogue new slides. And for those of you who wonder what the Full Time Equivalent adds up to for all these individuals, I'd estimate about 7.5 FTE from the university, not including the three private sector consultants. And it needs to be said that collaboration involves more than one or two token meetings between the IT staff and the client. It took two years of bimonthly, one-on-one meetings to hash out and test the functionality of the system and the layout of the screens. I want to emphasize that the VISC was a project that we all took on in addition to performing our normal job duties.

The second truth is that technology projects always require more money than you think they will, at least more than most of us in the arts or humanities fields of academia have in our operating budgets. Additionally, it seems that funding for equipment and software is always more readily available than funding for staff wages. My advice is to calculate what you think you'll need and add at least 50%. So far, we've been fortunate to receive over $120,000 in technology grants during the last ten years to develop the VISC database and the Electronic Library Web site. Yet, I think the primary mistake that higher education institutions make is the dependence on grant money to fund technology projects. Many times I have been told, "great idea, now go out and get a grant--our general fund can't support it." In truth, my college was also guilty of this mistake.

A source of tension between us and our ITS collaborators was that most of the money for the VISC project came from external grant funding. We had no college general fund money earmarked to pay ITS for system enhancements, cost overruns, or yearly maintenance. In fact, we naively thought that since CU's ITS staff members had created the database--and we're all one family--that they would surely maintain it free of charge! This was not their understanding, however. Furthermore, grant givers imposed fixed expenditure categories, including stipulations regarding who could be hired to work on the project. What I'd like to advocate quite emphatically is that administrators should treat technology projects with the same seriousness and attention they would give academic accreditation reviews. They would earnestly correct deficiencies by engaging in fund raising or diverting money from other sources to pay for additional faculty, to make curriculum changes, or to correct safety code violations in their buildings. They should also earmark permanent funding sources for technology development as part of their yearly general fund budget requests. The message should be taken to heart that technology development is not a finite process and a matter of a one-time fix. One grant isn't going to be enough to do the job in the long run.

A third truth is that calculating the amount of staffing needed for an image database project is always grossly underestimated, particularly if the faculty members and staff members involved are expected to carry out their "other" duties while engaging in technology development. We estimate that one slide can be scanned in a few minutes. Mounting the slide, applying and printing the labels takes another few minutes. Data entry takes ten more minutes. However, I advise you not to naively calculate the wages for staffing based only on these criteria. Do not forget to include money for staff members to catalogue the images prior to data entry. Do not overlook the simple fact that the text data associated with the image doesn't jump into the computer with the same ease as the scan, and that research must be done to verify even the simplest data.

The fundamental fact is that the importance and integrity of an educational image database lies in the text database first and foremost. Students and faculty members require data of great integrity. Other institutions and our clients will judge us based on the quality of our information. In an educational image database, a picture is not worth a thousand words. But according to stories I have heard from other slide curators, many administrators put the cart before the horse and want their staff to do imaging projects without a database to manage the images. You wouldn't buy 10,000 books and store them in a warehouse, and call it a library. Similarly, to embark on an image scanning project without a database to manage and retrieve the images, and without scholarly text to educate your clients is foolhardy to say the least. Yet I heard one administrator say, "I don't care so much about the cataloguing or the database, just give me images." Another asked me, "can't you get a student to write you a little program?" And another: "Maybe you could take a week and learn a software program and write your own database." Somehow these administrators thought that simply having pictures on a computer screen meant that their departments were technically savvy. To them, the difficulty of creating a database, as well as the importance of the words accompanying the images, were lost.

A fourth truth that I learned is that there is a language differential between Information Technology personnel and their non-technical clients. Even with our previous database as a model, conveying to IT personnel what we wanted the final VISC product to be was not always easy. One example occurred when I was discussing with one of the ITS programmers the various reports we wanted our database to perform for us. I said we needed simple reports, such as how many images circulated per year, which slides were used most often and by whom, and so on. When the programmer met with me to demonstrate how the reports would function, I asked the question, "Now, how do I print them?" He stared at me for a moment as if I was daft and replied, "You asked for reports, you didn't say you wanted them to print out." The word "report" did not imply the same functionality to him as it did to me. Thankfully, there were few instances like this. Yet this example underscores the need for both sides to communicate clearly, to reiterate what is expected time and again, and never to assume that words hold the same meaning for everyone.

The fifth truth I learned is that there is no such thing as "the perfect" equipment. It's going to be out-dated in two to five years any way, so go ahead and pick a brand, based on advice from people you trust and your institution's guidelines. But even then, cosmic rays will intervene so that of two identical new computers, one will run smoothly and the other will not. So expect equipment and software malfunctions, and don't browbeat yourself when you later decide you chose the wrong brand. And, of course, treat the IT and technical support staff with great respect.

Another area that people get hung up on is whether to use a PC or a Mac, and what software to use. The reality is that these decisions are probably going to be decided by someone other than the project director, for a variety of unrelated reasons. So, I'd advise you to give up any personal attachments you may have, and go with whichever platforms the people who hold the purse strings will support. In our case it was PC and Oracle. Though, truthfully, our project has involved both PCs and Macs for different tasks. The prototype databases were written in dBase III and FileMaker Pro.

My final piece of advice is that you can't let the magnitude of the technology project, whether it be the staff time involved or the costs, keep you from beginning the journey. Our reputations as institutions of higher learning are defined not only by the caliber of our faculty and curricula, but also by the sophistication of our information technology resources for instruction and research. Students and faculty members increasingly expect to access educational resources online. Not to have our image collections and libraries computer accessible is seen as substandard. We must begin the journey, even if the first steps are small.

We are fortunate that the President of the University of Colorado, Dr. John Buechner, understands the importance of technology development in every department and college on our four-campus system. He is leading an initiative, called the Total Learning Environment, which includes among its goals, furthering technology projects in the academic environment. The TLE program embraces many of the same truths that I have mentioned, including the aspect of faculty mentoring. At a June 1999, budget retreat, President Buechner outlined several strategic TLE priorities, one of which emphasizes: "Maximizing faculty contributions, with an emphasis on redefining and differentiating faculty roles, clarifying contributions through service; integrating teaching, research, and service responsibilities; and an enhancement of the reward system." Another TLE priority is: "Entrepreneurial program delivery, which will target specific markets, commercialize learning technology, expand the use of enterprise models, encourage business approaches, increase revenue streams and maximize partnership opportunities." (CU Silver and Gold Record, June 10, 1999.)

We believe that the VISC database and the Electronic Library Web site are examples of the TLE initiative in action, and evidence that the University of Colorado is embracing the opportunity to move educational resources into the digital and perhaps commercial realms.

Information Technology Services/Application and Information Systems

An IT perspective by Robynn Tripp

Technical Specifications

The system server for VISC is run on a Windows NT 4.0 platform. Data is stored on the server in

an Oracle 7.3 database and client side user screens were developed in Oracle Forms 4.5. Reports and adhoc queries were built using Oracle Reports 2.5 and Andyne's GQL. Image files, currently being created in Adobe PhotoShop 4.0 in Jpeg format, are stored on the server in a separate file system in three different jpeg resolutions. Presenting data with an actual image on the client side application involves accessing the data from the database and integrating it with the image file from the server file system. Security on the system is controlled through the client-side application, the NT operating system, and the Oracle database. The minimum client configuration for VISC users is Windows 95 or NT and at least 16 MB of RAM.

The ELCALP web site was built on a Windows NT platform using Microsoft's Internet Information Server (IIS) and an Oracle database server. Customer Active Server Page (ASP) programs handle search requests and perform queries on the VISC Oracle database. Views, or subsets, of the Oracle database were constructed specifically for the ELCALP web site to facilitate faster retrieval on the information. Results of those queries are parsed, formatted, and returned as HTML to a web browser, enabling the user to browse the text and images housed in the electronic library.

Development of the system

The core application development team was comprised of two project managers from Information Technology Services (ITS), a project manager from the Visual Resources Center with slide library curator experience, an Oracle Database Administrator (DBA) from ITS, two programmers from ITS with GUI development experience, another slide curator from VRC, and two faculty members from the College of Architecture and Planning. Additional staff from ITS and the College of Architecture and Planning were pulled into the project as needed. The goal of the development team was to come up with an application that would be a logical replacement for their current system, able to use the converted data from the current system, user friendly, easily understood with flexible entry and query capabilities, and responsive to changing technologies. The sheer number of slides and the information that needed to be gathered and maintained on those slides dictated that the data be kept in a robust database that ran on a stable platform. Oracle was chosen not only because it could handle the complex and large amount of data expected, but also because Oracle was an emerging standard for the University.

Once the development environment was established, the data model for the system had to be constructed. Several months were devoted to this task, which involved defining table structures to hold the data, relationships between the tables, and joins and constraints on the table columns. Screen prototyping began after the data model was completed. Initially, the field layouts on the screens were sketched on paper and reviewed by the core group. Once a rough design was agreed upon, a prototype of the screen was developed with the Forms development tool. Members of the core group worked with the prototype screens to familiarize themselves with the "look and feel" of the GUI environment and to make recommendations on navigation wit hin the application and functionality as a whole. Development of the screens also became a testing point for the data model and there were times when the data model was revised to streamline or provide additional functionality to the application. Data from the previous system had to be extracted, converted when necessary, and loaded into the Oracle tables. Upon completion of the screen development and data conversion, the screens were packaged together in specific modules for cataloging, circulation, and system maintenance. Reports and queries were written and integrated with the modules where applicable.

VISC was deployed to the Visual Resources Center on the Boulder campus in the fall of 1997. The primary users of the system had been involved as core members of the development team and were able to help ensure the success of the implementation. There were modifications and additions that were made to the system by ITS, as well as data clean-up from the previous system that had to be completed over the next several months and in the spring of 1998, the application was implemented on the Denver campus.

Key points regarding development and implementation

When the project was undertaken and the core development group was formed, the goal of the project was supported not only by each team member, but by the Dean and Associate Dean of the College of Architecture and Planning, several faculty members from the College, and top level managers within Information Technology Services. Because there was a common, shared goal that was widely supported, there was a collaborative, cooperative environment generated for the development of the system. Each member of the core development group had their own distinctive perspective on the project, yet there was an optimum amount of interaction, sharing of ideas, and an understanding that there was a common goal behind the work. There was also an underlying idea beneath the project that the application could later be used by other similar departments on campus, such as the department of Fine Arts, for their slide libraries.

The actual application development process to create the screens and write the code to provide the functionality took approximately 5 months. The two programmers involved in writing the code had some experience with GUI programming, but had never worked with the Forms development tool and some of the development time was given to overcoming the learning curve on the new tool. Progress on development was sidelined when the data model had to be modified slightly to improve functionality of the application.

Funding of the project was also an issue during development. Initial funding for the project came from a grant secured by faculty and staff members from the College of Architecture and Planning and was

matched by funding from Information Technology Services. The initial funding was still not enough to cover the entire cost of developing the application and, again, momentum on the project was slowed as the members of the development group scrambled to get additional funding to complete the project. Funding for maintenance, continued development, and revisions for VISC remains a problem even today. Grants cannot be obtained for these tasks, general funding within the University is not available, and the current ITS budget cannot accommodate the amount needed on a year to year basis.

Finally, implementation of the system on two campuses proved to be a challenging experience for the VISC developers. The initial implementation plan included deployment of the application on both the Boulder and Denver campuses with the assumption that the IT support on both campuses will be similar. Implementation on the Boulder campus was a relatively smooth process. The DBA on the project was also the NT administrator and the network connections, database connections, installation of the runtime application, and connections to the images were all done by the DBA and developers on the development team. Accustomed to implementing administrative applications and providing all support around those applications, the group encountered a different IT support environment on the Denver campus when it came time to deploy the application there. At that time, the main support focus for the Denver campus IT department centered primarily on student lab support. Putting the application up on the Denver campus involved a tremendous amount of interaction between Boulder campus ITS staff, the Denver NT administrator, and the Visual Resources Center staff. The Denver customer support strategy had to be changed to include the VISC application support.

Future of VISC

This application was developed over a two year period and has been in production for two years. Given the rate of change within the software industry, it could be argued that this application is fast on its way to being outdated. The architecture of the system is two-tier client-server with a fairly heavy client-side application. The recommendation in the industry is to replace the heavy client-server application with a thin client, or at the very least with a three-tier architecture that allows for a thin client on the first tier, application processing on a middle tier and server based processing on the third tier. The Oracle database needs to be migrated from version 7.3 to the newest version, 8i, and the screens need to be updated from version 4.5 to 5.0. Likewise, the reports and queries also need to be upgraded to new versions. Upgrading the application to new versions of software not only enhances and ensures performance, but it provides additional functionality as well. For example, moving the database from Oracle 7.3 to 8i allows the images currently being stored in a separate file system on the server to be stored directly in the Oracle database. Images can be stored in one format and rendered in whatever format is desired by the Oracle 8i database.

Of course, migrating an application involves funding and the availability of further funding remains to be seen. Various Universities and colleges in the country have expressed an interest in purchasing VISC. In the summer of 1999, the department of Fine Arts on the Boulder campus began the process of securing funds to obtain a modified version of VISC for their slide library. The modified version will likely be provided in the newer versions of the software. Based on this interest, the Department of Technology Transfer at the University of Colorado has obtained rights to the software and distribution of VISC to other Universities remains to be determined. As part of the University's "Total Learning Environment" initiative, consideration is being given to the possibility of developing a general application based on VISC that would be more generic in nature and would enable a variety of campus departments to use it for their slide collections. As more universities and colleges across the country start developing IT infrastructures and applications to enhance the student learning and faculty teaching environments, IT departments need to be receptive to the idea of collaboration to accomplish these

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TRACK 1

Wednesday, October 27

10:30 a.m. - 11:15 a.m.	Track 1 : A Network Services Infrastructure for the Next Century
	Track 1 : A Scalable Network Funding Process
11:45 a.m. - 12:30 p.m.	Track 1 : Solutions for Delivering Digital Content in the New Academic Enterprise
	Track 1 : Individualized WWW Home Pages
3:45 p.m. - 4:30 p.m.	Track 1 : Metadata Integration
	Track 1 : How Did He Get to See That? Authorization on the Web

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Thursday, October 28

8:15 a.m. - 9:00 a.m.	Track 1 : The Carolina Computing Initiative--Building the Infrastructure to Support and Promote Curricular Innovation
	Track 1 : Backstage: Case Study of an Intranet
11:45 a.m. - 12:30 p.m.	Track 1 : Implementation and Implications of Digital Services in Learning Centers
	Track 1 : User Empowered Process for Information Technology Planning and Implementation
2:15 p.m. - 3:00 p.m.	Track 1 : Collaborative Support for the Distributed University
	Track 1 : Integration of Digital Satellite and Terrestrial Networks for Education and Training
3:45 p.m. - 4:30 p.m.	Track 1 : Sustaining a Virtual Support Organization: A Model for the New Millennium
	Track 1 : E-Journals: The "E" Doesn't Stand for Easy

Friday, October 29

8:15 a.m. - 9:00 a.m.	Track 1 : Building to Scale: An Analysis of Web-Based Services in CIC (Big Ten) Libraries
	Track 1 : Strategy for Providing High Speed Networks to Residences
9:30 a.m. - 10:15 a.m.	Track 1 : Component and Web Services Development Using URBA and WebApplication

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Development Using URBA and WebApplication Server

Track 1 : A Warehouse Design: Making It Simple

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A Network Services Infrastructure for the Next Century
Track 1
Wednesday, October 27
10:30 a.m. - 11:15 a.m.
Room 202, Convention Center

- Richard M. Kogut, Chief IT Architect, Office of Info Svcs, Georgetown University 👤

Georgetown University is laying the groundwork for effectively supporting an expanding number of network-centric services for students, staff, faculty, and alumni. A key element will be the Electronic ID Office, with an active role in the creation and evolution of policies, processes, and usage of electronic IDs. This presentation will focus on the solution set chosen by the University as well as key challenges and issues faced in making choices, building consensus, and implementing systems and processes. It will also discuss the likely evolution and expanding utilization of the network services infrastructure.

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A Scalable Network Funding Process
Track 1
Wednesday, October 27
10:30 a.m. - 11:15 a.m.
Room 203, Convention Center

- Clifford W. Frost, Director, Communication & Network Services, University of California, Berkeley 👤
- Jack McCredie, CIO & Associate Vice Chancellor, Information Systems & Technology, University of California, Berkeley 👤

This presentation describes a scalable funding model developed at UC Berkeley that encourages rational behaviors in users and network service providers, fits UCB's organizational culture, and will enable the network to evolve to meet future needs. The model includes high-speed on-campus access and lower-speed off-campus modem access. Presenters will discuss the organizational process used to move the University to a scalable model based on a combination of central funding and departmental charges, as well as the many problems that are emerging as Internet2 becomes operational.

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Solutions for Delivering Digital Content in the New Academic Enterprise
Track 1
Wednesday, October 27
11:45 a.m. - 12:30 p.m.
Room 202, Convention Center

- David Lifka, Systems Programmer, Cornell Theory Center, Cornell University 👤
- Scott O'Hare, Vice President and General Manager, Higher Education, Dell Computer Corporation 👤
- Russell S. Vaught, Associate Vice Provost, Computer & Information Systems, The Pennsylvania State University 👤

Utilizing the full power of the Internet and developing Internet-based tools can revolutionize a campus. Linking with Internet-based business partners can provide a highly effective method of assisting the academic enterprise in determining and implementing its IT strategy. This session will discuss how Internet solution providers can develop tools to plan for technology transitions, to select the services and products most relevant to its needs, and to drive institution (and student) compliance with the institution's desired standards tailored specifically for an academic enterprise.

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Individualized WWW Home Pages
Track 1
Wednesday, October 27
11:45 a.m. - 12:30 p.m.
Room 203, Convention Center

- Christopher Connolly, Assistant Director, WWW, University IT, Villanova University

In spring 1999 Villanova University released a unique new Web site that can be individually modified, which means that anyone at VU can have his or her own unique home base with links to personalized information. Students can retrieve class lists and review instructors' home pages or references posted as well as participate in course discussion groups and send e-mail to classmates and professors. Similarly, professors have links to their own schedule, including picture class lists, course discussion groups, and student e-mail addresses. Additionally, all users can add their own personalized links on the home page, and messages can be posted to all or a subset of students, faculty, and/or staff.

http://www.educause.edu/ir/library/html/edu9901/edu9901.html

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Metadata Integration
Track 1
Wednesday, October 27
3:45 p.m. - 4:30 p.m.
Room 202, Convention Center

- Michael Glasser, Database Administrator, University of Maryland 👤
- Barbara Hope, Director, Data Administration and Data Architecture, University of Maryland 👤
- Maribeth Mattingly, Asst Director, Data Admin and Data Warehouse, University of Maryland 👤

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As data are widely distributed throughout an organization, it is critical to understand their meaning and the context in which they are presented. The University of Maryland's Office of Data Administration (ODA) was charged with identifying and defining institutional data elements, indicating who had responsibility for them, and educating the campus community on their use. ODA designed a single-source metadata application that enabled the office to leverage the comprehensive "data about data" and present it in multiple ways to users. This integration of metadata allows delivery of meaningful information to all types of users, enhances the ability to educate users, provides a contextual reference for querying, and increases the friendliness of the warehouse.

http://www.educause.edu/ir/library/html/edu9902/edu9902.html

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How Did He Get to See That? Authorization on the Web
Track 1
Wednesday, October 27
3:45 p.m. - 4:30 p.m.
Room 203, Convention Center

- Albert Steiner, Coordinator Distributed Computing, Northwestern University 👤

Network-based class resources must often be restricted to students, instructors, and others related to the classes. Copyright restrictions and intellectual property rights must be honored by an authorizations infrastructure. Class and suborganization membership information must be leveraged from information gathered and controlled by registrars and human resource departments. In addition, there must be ways to augment that information. The ability to send bulk e-mail must also be restricted to an arbitrary group of persons for individual schools and organizations. The person(s) controlling each group's membership must also be controlled by an authorization group. Northwestern's Authentication/Authorization System, used since 1998, will be presented as an example of this infrastructure.

http://www.educause.edu/ir/library/html/edu9903/edu9903.html

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EDUCAUSE '99
Celebrating New Beginnings

The Carolina Computing Initiative--Building the Infrastructure to Support and Promote Curricular Innovation
Track 1
Thursday, October 28
8:15 a.m. - 9:00 a.m.
Room 202, Convention Center

- Linwood Futrelle, Director, Distributed Support, University of North Carolina at Chapel Hill 👤
- Marian G. Moore, Vice Chancellor for Information Technology, University of North Carolina at Chapel Hill 👤
- Kathleen Thomas, Manager, Center for Instructional Technology, University of North Carolina at Chapel Hill 👤

To assure access to computers in an affordable, realizable way, The University of North Carolina at Chapel Hill has instituted the Carolina Computing Initiative, a plan to ensure that students, faculty and staff have appropriate technology and are able to use it effectively and efficiently in their various endeavors. At the center of the initiative is the requirement that, beginning with freshmen in the fall of 2000, undergraduates at the University of North Carolina at Chapel Hill must own laptop computers that meet university specifications. The laptop requirement is both a recognition of and response to Carolina's responsibility to prepare students to live and work successfully in the 21st century. It is also an obligation to make computer ownership purposeful and affordable.

Prior to implementing the initiative requirement for freshmen, Carolina has begun a program to equip all faculty, academic staff and teaching graduate students in the College of Arts and Sciences with an appropriate level of computing resources.

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Part I of this presentation will discuss the Initiative, which is still in the early planning stages, the lessons learned, what has worked well and what the challenges have been.

Part II will outline the program developed to distribute and support the faculty in the College of Arts and Sciences. Central are the activities of two of the cross departmental teams responsible for making the initiative work. The activities of the TechnoComfort and Logistics teams show how several units can blend their efforts to produce a successful program. *A follow-up Birds of a Feather session is scheduled for this afternoon at 4:45.*

👤 *Click on this icon to see the presenter's biographical information.*

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Backstage: Case Study of an Intranet
Track 1
Thursday, October 28
8:15 a.m. - 9:00 a.m.
Room 203, Convention Center

- John Cady, Technologist-ITD Marketing & Tech Communications, University of Michigan-Ann Arbor 👤
- Wanda Monroe, Communications Specialist, University of Michigan-Ann Arbor 👤

Managing and sharing internal information can be challenging on a good day. Add to that challenge hundreds of employees in various locations using different types of computers. Learn how the University of Michigan's Information Technology Division (ITD) solved many of its internal communication problems by developing Backstage, the ITD intranet. This multimedia presentation will identify what it takes to build an intranet and provide details on design and development strategies, security issues, and ongoing maintenance.

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Implementation and Implications of Digital Services in Learning Centers
Track 1
Thursday, October 28
11:45 a.m. - 12:30 p.m.
Room 202, Convention Center

- Otmar Foelsche, Director, Humanities Resources, Dartmouth College 👤

This presentation will address the challenges of digital vs. analog services, network bandwidth, and delivery over internal and external networks, server technology, conversion technology, platform compatibility issues, implications for learning and teaching. Included will be a report on Dartmouth's experience, samples and live demos, as well as information on planning, implementation, implications, and cost effectiveness of a move to digital services.

http://www.educause.edu/ir/library/html/edu9930/edu9930.html

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User Empowered Process for Information Technology Planning and Implementation
Track 1
Thursday, October 28
11:45 a.m. - 12:30 p.m.
Room 203, Convention Center

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- Joseph E. Grimes, Special Assistant to Provost for Faculty Development and Industrial Relations, California Polytechnic State University-San Luis Obispo 👤
- Jeremiah J. Hanley, Vice Provost/CIO for ITS, California Polytechnic State University-San Luis Obispo 👤
- Paul J. Zingg, Provost and Vice President for Academic Affairs, California Polytechnic State University-San Luis Obispo 👤

The teaching/learning process must drive technology planning. Over the past several years an effort at Cal Poly has been under way to ensure that the culture of participatory and strategic governance promotes this principle, with both the users and the providers being of the same understanding and participating as part of the same team. The key to a successful effort is informed, engaged, and supportive institutional leadership. This presentation will show how this process has evolved, describing a process of continually advancing a user-defined strategic goals document with general categories of Access, Integration, Skills, Simplicity, and Process.

http://www.educause.edu/ir/library/html/edu9931/edu9931.html

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Collaborative Support for the Distributed University
Track 1
Thursday, October 28
2:15 p.m. - 3:00 p.m.
Room 202, Convention Center

- Anne Agee, Executive Director, Instructional Technology, George Mason University 👤
- Keith B. Segerson, Executive Director, UCIS, George Mason University 👤
- John G. Zenelis, University Librarian, George Mason University 👤

This session will discuss strategies for leveraging financial, information, and people resources collaboratively to provide effective and efficient information technology support for a large, multi-campus university. It will feature the heads of the three information technology units at George Mason University: University Computing, University Libraries, and Instructional Technology. The presenters will offer strategies for ensuring equitable distribution of resources and services, managing growth in campus needs, and creating realistic expectations for support among campus customers.

http://www.educause.edu/ir/library/html/edu9932/edu9932.html

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Integration of Digital Satellite and Terrestrial Networks for Education and Training

Track 1
Thursday, October 28
2:15 p.m. - 3:00 p.m.
Room 203, Convention Center

- Adrian Vranch, Academic Developments Manager, University of Plymouth 👤

The University of Plymouth has developed an integrated digital networking infrastructure for voice, video, and data throughout the region to deliver a variety of education and training programs. This session will describe how the infrastructure has been implemented using a novel combination of ISDN, SWAN (a regional ATM network), and digital MPEG2 satellite broadcasts from the University's uplink. It will discuss cost benefits analysis in terms of low cost, wide access, and quality, and will describe such uses as research seminars for health care students across distributed campuses and training of surgeons in the region's hospitals using live, interactive digital satellite TV.

http://www.educause.edu/ir/library/html/edu9947/edu9947.html

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Sustaining a Virtual Support Organization: A Model for the New Millennium
Track 1
Thursday, October 28
3:45 p.m. - 4:30 p.m.
Room 202, Convention Center

- James O. Austin, Director, Faculty Center for Instructional Innovation, University of Arizona 👤
- Barbara Hoffman, Associate Director, Center for Computing & Information Technology, University of Arizona 👤
- Karen Williams, Digital Library Initiatives Team Leader, University of Arizona 👤

As the demand to integrate IT into every aspect of university life continues to grow, the University of Arizona has explored new support models. The creation of the Faculty Development Partnership in 1995 established functional links between diverse support units including the computer center, library, teaching center, video services, and an academic new media research center. Two years of successful collaboration resulted in the opening of the Faculty Center for Instructional Innovation. The FCII is both a crowning achievement and a launch pad for expanding collaborative university initiatives. This presentation will describe the role of the partnership and the potential of a virtual support organization.

http://www.educause.edu/ir/library/html/edu9904/edu9904.html

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E-Journals: The "E" Doesn't Stand for Easy
Track 1
Thursday, October 28
3:45 p.m. - 4:30 p.m.
Room 203, Convention Center

- Mary E. Helms, Associate Director for Technical Services and Associate Professor, University of Nebraska Medical Center 👤
- Rose Schinker, Collection Development, Head, University of Nebraska Medical Center 👤

One of the most sought-after products on the Web is access to electronic journals, or "e-journals." The popularity of e-journals has created a paradigm shift in how libraries manage information resources that are no longer limited to the printed page but can also be delivered to the desktop with a few keystrokes. But e-journals have created their own set of management and technical issues that must be determined, discussed, and resolved before library users can just "point and click" to obtain immediate access to this new information resource format. This presentation will discuss the trials, tribulations, and triumphs of such a challenge.

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Building to Scale: An Analysis of Web-Based Services in CIC (Big Ten) Libraries
Track 1
Friday, October 29
8:15 a.m. - 9:00 a.m.
Room 202, Convention Center

- Barbara I. Dewey, Dean of Libraries, University of Tennessee 👤

This session will provide an analysis of "virtual" services located on the 13 CIC (Big Ten) member libraries' Web pages. All CIC institutions are reformulating existing services for the Web platform and developing new services to better serve the large student, faculty, and staff populations on their campuses. CIC libraries are working on major collective projects such as the Virtual Electronic Library. Issues and strategies related to scaling library services with Web-based delivery systems will be discussed using data from a survey of the member libraries as well as in-depth analysis of each library Web site. The presentation will also summarize successes and problems with the functionality and "findability" of different services (reference, instruction, electronic reserves, virtual tours, etc.).

http://www.educause.edu/ir/library/html/edu9933/edu9933.html

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Strategy for Providing High Speed Networks to Residences
Track 1
Friday, October 29
8:15 a.m. - 9:00 a.m.
Room 203, Convention Center

- Andrew Palms, Director, Product Development, University of Michigan-Ann Arbor 👤

High-speed networking options for residences are beginning to become available. The University of Michigan, Ann Arbor, is beginning to analyze various markets, their requirements, and how they can be met by current or new technologies. This presentation will present the University's experiences with an ADSL pilot, plans for cable modems, and existing ISDN and modem services. A brief overview of the technology will give way to a focus on experiences working with the local telephone and cable companies, including their strategies and the University's resulting strategy.

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Component and Web Services Development Using URBA and WebApplication Server
Track 1
Friday, October 29
9:30 a.m. - 10:15 a.m.
Room 202, Convention Center

- Robert D. Losee, Technology Practices Coordinator, University of Nebraska - Lincoln 👤
- Shawn Mitchell, Manager, Systems Integration Team, Indiana University Bloomington 👤
- John F. Walsh, Director, University Information Systems, Indiana University 👤
- Kent Wendel, Coordinator of Information Systems, University of Nebraska - Lincoln 👤

Indiana University has a heterogeneous administrative systems environment that will feature PeopleSoft modules for HR/payroll and student administration and a financial/procurement system that is a combination of in-house development and vendor-supplied modules. The challenge is to have a technology infrastructure that will accommodate current and future component specifications such as COM+/CORBA and EnterpriseJavaBeans. Indiana has selected the Universal Request Broker Architecture (URBA) from Compuware, while a different aspect of Compuware enabling technology -- the WebApplication Server -- is used at the University of Nebraska. Presenters will discuss how the Compuware products have allowed rapid development and deployment of Web services that interact with student information databases.

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A Warehouse Design: Making It Simple
Track 1
Friday, October 29
9:30 a.m. - 10:15 a.m.
Room 203, Convention Center

- Scott Thorne, MIT Data Administrator, MIT 👤

MIT has implemented a warehouse environment that brings several elements of function and design together, supporting ad hoc reporting, data distribution, and intersystem feeds with a secure, open, and flexible design. The warehouse has row-level access control, sharing authorization rules with the transactional systems through the use of an enterprise authorization system. Data modeling techniques with end users create star schemas to represent the SAP financial and purchasing information. Other design features include a metadata-driven data conversion and load process, distributed report creation, encrypted transport, and a system of automated integrity checks and controls.

http://www.educause.edu/ir/library/html/edu9934/edu9934.html

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Program Information

Details of the various aspects of the conference program can be seen by following the links below. Activities begin on Tuesday, October 26, with the preconference seminars. The conference opens Wednesday morning with the general session featuring Gen. Colin L. Powell. The conference will close with Friday's general session, which will end at approximately 11:30 a.m.

The best way to plan your conference schedule is to use our **Itinerary Builder**, which allows you to chart, save, update, download, and print your conference schedule before you even get to Long Beach. Used in conjunction with the **Knowledge Pathfinder**, the Itinerary Builder gives you the opportunity to explore all the conference sessions, workshops, and exhibits, and pinpoint topics related to your specific interests and needs.

If you're looking for discussion on specific subjects, look at the informal sessions scheduled for "communities of interest" (such as constitutent and birds of a feather groups) -- with the option to add your own if you don't find it.

Also, be sure to try our Corporate Exhibit Hall Guide. The guide will help you find and understand the products and services that will be offered in the corporate exhibit hall. You select the topics and the program delivers any exhibiting company that relates to those topics.

Preconference Seminars

- All preconference seminars are Tuesday, October 26.
- Attendance at the preconference seminars is limited.

Full Conference Schedule

(This is the full schedule. It lists all events except corporate exhibits, which can be found on the corporate participation page. Links to specific dates and individual events can be found below.

- Tuesday schedule
- Wednesday schedule
- Thursday schedule
- Friday schedule

General Session Speakers

- ORACLE presents General Colin L. Powell, USA (Ret.)
- Rita Colwell, director of the National Science Foundation
  (Sponsored by MCI*Worldcom*)

- Barry Munitz, president and CEO, the J. Paul Getty Trust
  (Sponsored by SCT)

EDUCAUSE Awards

Birds of a Feather Sessions (At a Glance)

Constituent Group Meetings (At a Glance)

Current Issues Roundtables (At a Glance)

Featured Speakers (At a Glance)

Meetings (At a Glance)
(EDUCAUSE Board, business meeting, program committee, member committees, etc.)

Poster Sessions (At a Glance)

Track descriptions with links to presentations, their times, and abstracts

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